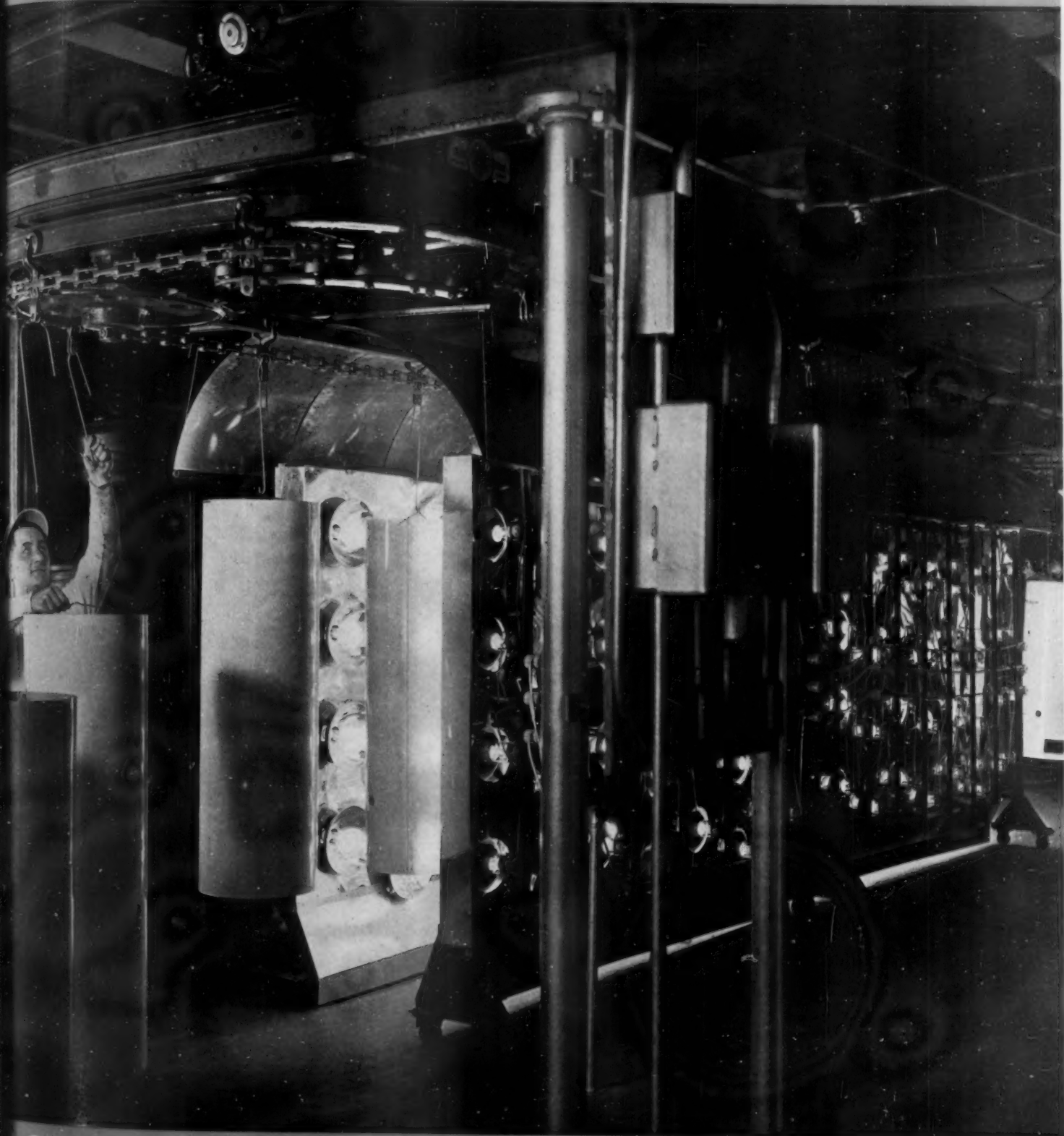


JUNE, 1942

ORGANIC FINISHING

SECTION OF METAL FINISHING



ACQUERING • ENAMELING • JAPANNING • PAINTING

ZAPON FINISHES

☆ ☆ ☆ ☆ **FOR** ☆ ☆ ☆ ☆

U.S. GOVERNMENT SPECIFICATIONS

Finishes are of the utmost importance to military equipment. They must be able to stand up to rigorous conditions anywhere on earth. Zapon has developed a very complete line of finishes to meet U. S. Government specifications. Whether it's bombs or cartridge cases, helmets or glider planes, we can satisfy U. S. requirements for the finish.

Finishing never stands still.

Finish for a bomb is radically different from that for a glider. Zapon constantly meets every challenge, improves the old, brings forth the new and suggests ways for industry to better apply finishes. All in war as in peace.

With changes so frequent, we believe through our experience and knowledge of conditions, we can be of greatest service if you consult with us.



ZAPON DIVISION • ATLAS POWDER COMPANY

Eastern Sales: Stamford, Conn. Western Sales: North Chicago, Ill.

INDUSTRIAL FINISHES

ORGANIC FINISHING

SECTION OF METAL FINISHING

JUNE, 1942

+

CONTENTS

+

ARTICLES

Finishing of Dairy Trucks. 334

Luminescent Coatings ... 335

Finishing Defense Products

—Part 3 conclusion—By

Frank V. Faulhaber 339

+

DEPARTMENTS

New Equipment 342

Manufacturers' Literature . 343

~

Finishes For Rubber

It is generally known that rubber deteriorates under many conditions. Exposure to sunlight, contact with certain oils and chemicals, etc. may ruin some rubber compounds and they must be cared for and protected in order to forestall breakdown and obtain maximum service. One method of caring for rubber is by protecting it with coatings of organic finishing materials.

For some years organic finishing materials formulated expressly for application to rubber have been on the market. These finishing materials are not as generally well known as those made for steel, wood, etc. Being a specialty item they are familiar to only a relatively few and do not represent a large portion of all the finishing materials which are annually produced. However, they are extremely important in their own field and many of the leading manufacturers of finishing materials have and are spending time and money in their development.

The restrictions which we have seen placed on rubber mean one thing very plainly. This strategic material must be conserved. Without it our war industry and our war machine would be hopelessly lost. It is absolutely essential, then, that every rubber article be treated with care and protected from deterioration in order that its period of usefulness may be prolonged to the utmost. It is, therefore, our belief that we will see a large upswing in the manufacture and use of finishing materials for rubber. And this upswing will only be another proof—that of the ability of the finishing industry to provide a coating for any article of any material that requires protection or decoration.

Finishing of Dairy Trucks

Pioneer Chicago Dairy Keeps Delivery Units Looking Like New

IN the preparation, handling, distribution, and sale of food products cleanliness is recognized as a matter of paramount importance. Appreciating this fact, the Bowman Dairy Company, pioneer distributor of milk and its allied products in Chicago and its far-flung suburbs, has stressed it with particular emphasis in the upkeep and neat appearance of its large fleet of delivery units, its single trucks, tractors, trailers, and some horse-drawn wagons, totaling some 1700 vehicles.

All Bowman trucks, painted a brilliant white with gold lettering, are washed regularly at the different branch plants from which they cover their respective routes. No mars, dents, or scratches are tolerated. Any imperfections on a truck body are at once corrected. For handling this work the company maintains a large repair and paint shop on the south side of the city. Here, the paint shop occupies a section some 200' x 175' in a brick building with arched truss roof. The shop will easily accommodate 25 units, while a well-fenced yard 100' x 125' will care for vehicles awaiting repair or repainting.

Of the fleet of 1700 units operated by the Bowman Company, all but about half are all metal—galvanized—motor trucks and trailers. Since no definite schedule as to the repainting of these various units is followed,—division managers simply sending units to the paint shop when they deem it necessary—each job becomes an individual study in itself. Sometimes it is merely a retouching of marred and blemished spots; again, it is the complete removal of old paint, down to the bare metal, followed by a painting of the entire unit,—body, chassis, wheels, and all. Approximately 58 units of all types pass through the paint shop each month.

In the complete refinishing and painting of a motor truck, the old paint is chipped and scraped off, after which

the surface is hand-sanded, using a Number 380 smooth paper, followed by a thorough rubbing and cleaning with gasoline. All chrome trim is covered with masking tape as well as the frames of the rear view mirror, lamps, and windshield, door handles, and windshield wiper; glass being protected by a coat of grease. A coat of "Lithoform" is brushed on the bare metal surfaces and allowed to dry for about two hours, when the entire surface is rubbed with dry wool and a white prime coat sprayed on, whereupon the unit is allowed to dry overnight. The next day a finish coat of white synthetic enamel is sprayed, the operator going around the unit several times until it looks right. After this comes an overnight drying. Lettering in gold (with green outline) follows, which is put on with Decalomania transfers, and the decorative

stripes, after which a protective coat of varnish is brushed over the lettering.

The inside of all units is given a single brush coat of gray enamel; the chassis painted green; and the wheels white enameled,—all brush coats.

When new units are sent from the factory, they are delivered with a prime coat to the paint shop, where the finish coats and lettering are applied.

Paint spraying is all done in a large, auto type spray booth, providing ample room for the operator to get around on all sides of a vehicle without any crowding into cramped and narrow spaces. The booth is well lighted—by daylight streaming in through the windows, or, when needed, by a battery of six vapor-proof reflector lamps in the ceiling of the booth. Cup guns are used in all spray work.



Group of small motor truck units used in serving the house to house trade.

LUMINESCENT COATINGS

Report of Sub-Committee No. 43 of the New York Paint and Varnish Production Club.

Purpose

THE purpose of this report is to describe luminescent paints and coatings from the standpoint of their known properties and uses at the present time, and to indicate their practical value and limitations. It is designed particularly for those persons interested in the manufacture and use of luminescent coatings. Photoluminescent coatings only are considered, and those containing radioactive materials are not included.

Definition of Terms

Luminescent Coatings (Excluding Radioactive Materials)—Luminescent coatings are coatings which have the property of converting radiant energy of short wave-length (such as black light) to visible light. They may be further subdivided into fluorescent and phosphorescent coatings.

Fluorescent Coatings—Fluorescent coatings are those luminescent coatings which emit useful light only during activation by black light. Such coatings may have some afterglow, but it is not long enough to be considered of practical value.

Phosphorescent Coatings—Phosphorescent coatings are those luminescent coatings which glow when activated by short wave visible as well as black light, and continue to glow for appreciable intervals after the exciting light source is extinguished. In order to be considered phosphorescent, the afterglow must have a useful length from a few minutes to twelve hours or more.

Phosphorescent coatings are divided into two classes.

Phosphorescent Coatings—Type A—Type A phosphorescent coatings have a high brightness during the first few minutes after excitation ceases and the useful afterglow is relatively short, usually two hours or less.

Phosphorescent Coatings—Type B Type B phosphorescent coatings have a relatively low brightness shortly after excitation ceases, and the useful afterglow is relatively long, usually from two to twelve hours.

Black Light—Black light is the popular designation for the invisible near ultra-violet radiant energy most commonly used to produce fluorescent and phosphorescent effects. Its spectral range is approximately 3200 to 4200A.

Fluorescent Coatings

Inorganic Pigments—While a number of inorganic materials are fluorescent and useful as pigments, those of principal practical value are zinc sulfide or combined zinc and cadmium sulfides. Such pigments compare with lithopone or other zinc sulfide pigments in their paint-making properties and characteristics. They are relatively fine in particle size, may be incorporated in binders (vehicles) on standard paint milling equipment and yield normal paints. A range of fluorescent colors extending from green through yellow, orange and deep red is available. The colors of the pigments in visible light do not correspond to their fluorescent color. In some cases, organic dyes or other tinting materials are added to modify either the color in visible light or the fluorescent color. The addition of such tinting agents may somewhat decrease the fluorescent intensity. Inerts or extenders of the quality used in paints may also be added to modify the physical characteristics of the liquid paint but only at some sacrifice in fluorescent intensity. Under some conditions of exterior exposure in certain vehicles, there is a tendency to darken with accompanying loss of fluorescence. From the stand point of toxicity, these pigments are no more hazardous than other regularly used paint pigments.

Synthetic Organic Dyes and Pigments—The most important organic compounds that fluoresce are dyes. Many dyes give a brilliance under black light that is not equalled by any known natural minerals and by very few, if any, luminescent pigments. Dyes in powder form rarely fluoresce as brilliantly as when applied to textile fibers. Luminescent coatings are prepared by dispersing spirit or oil-soluble dyes in binders. The most important groups of spirit soluble dyes are:

Rhodamine
Thioflavine
Eosine
Phosphine
Auramine

The oil-soluble dyes used are limited chiefly to oleates or stearates of fluorescent basic dyes. For greater light fastness but with some sacrifice in fluorescent brilliance, organic pigments are used. They are represented by:

Sodium Red Lake C Toner
Rhodamine Tungstate Lake
Auramine Tungstate Lake

Metallo organic compounds, as the zinc salt of 8-hydroxyquinoline, have been used in England. Experiments have shown that molybdate lakes also fluoresce, and these may assume practical importance in the future. Other organic materials show fluorescence but their practical importance remains to be demonstrated.

While a wide range of shades can be obtained with fluorescent dyes on textiles, at present in formulating coatings the choice of these dyes is limited due to their lack of solubility in nonaqueous media. Chemical modifications to make them spirit or oil-soluble may result in loss of fluorescent properties.

These organic fluorescent dyes have very little resistance to sunlight and

consequently their use outdoors must of necessity be limited. Exposure to direct sunlight results in rapid loss of fluorescent characteristics. The metallo-organic compounds are reported to have somewhat improved weather resistance.

None of the organic compounds under discussion shows useful phosphorescent properties. Where phosphorescence is desired, inorganic pigments must be used.

Fluorescent dyes are generally considered to have a low degree of toxicity, and have been used in the past in coating compositions without any difficulty in this respect.

Characteristics and Limitations — Fluorescent coatings have been employed in the theatrical field for many years to obtain unusual lighting, decorating, and staging effects. Their potential value for novelties and in the advertising field is recognized. They are being used for direction guides during blackouts on instrument dials, maps and charts where black light activation is practical. The range of colors is wide and the fluorescent brilliance varies with the power of the black light. The usefulness of these finishes is limited by the availability, portability, and cost of the black light units. Fluorescent coatings will pick up to nearly full intensity of luminescence with a flash of activating "black light." In general the faster this pick up, the shorter the afterglow when the exciting light is extinguished.

From the standpoint of durability, fluorescent coatings are quite permanent when used *indoors*, without exposure to direct sunlight. When used *outdoors*, or under conditions of exposure to direct sunlight, coatings made with organic dyes are subject to the rapid loss of color and fluorescent properties. Experimental results have indicated that coatings made with inorganic pigments, properly formulated, may retain more than fifty per cent. of their fluorescent brilliance after a year or more of exterior exposure.

A lowering of temperature will tend to increase whatever afterglow the fluorescent coating may have.

Phosphorescent Coatings

The Type A phosphorescent pigments in most common use are zinc sulfide or zinc and cadmium sulfides, and the Type B are calcium sulfide, strontium sulfide or combinations of

the two. All phosphorescent pigments are relatively coarse in particle size since their phosphorescence depends upon a coarse, crystalline structure. They cannot be ground on a tightly-set roller mill or a stone mill without a serious loss in their phosphorescent efficiency. They are best incorporated in vehicles by stirring, mixing, or on a very loosely set roller mill. The range of phosphorescent colors is relatively small, Type A pigments usually having a green, yellow or orange phosphorescence, and Type B a violet blue or bluish green phosphorescence. The color of the materials in visible light is a dull white, with a grayish or yellowish tinge. Because of their extreme coarseness, phosphorescent coatings do not have very high hiding or whitening power, and occasionally white pigments such as titanium oxide, lithopone, or zinc sulfide are blended with them to supplement these characteristics. At times tinting pigments or dyes are added to modify either their color in visible light or their phosphorescent color. Inert extenders may be added to improve the physical properties of the liquid paint. Such additions should be avoided if at all possible, since they tend to decrease phosphorescence. Because of their extreme coarseness, all phosphorescent pigments have poor gloss characteristics, and a marked tendency toward settling.

Type A pigments behave in paint vehicles in a manner similar to lithopone and zinc sulfide. Type B pigments are quite reactive and are also extremely sensitive to moisture, which destroys phosphorescence. They must be stored in moisture-proof containers and must be used in coating compositions in such a way as to be protected from moisture. Under some conditions of exterior exposure in certain vehicles, there is a tendency for Type A pigments to darken with accompanying loss of phosphorescence. From the standpoint of toxicity, these phosphorescent pigments are no more hazardous than other pigments regularly used in paints. It must be emphasized that this report does not apply to radioactive materials.

Characteristics and Limitations — Phosphorescent coatings also have found application in the theatre for producing unusual staging and costuming effects. Their use in the novelty field has been more extensive than that of the fluorescent finishes, and

their possibilities for general interior decoration are becoming more widely recognized. They may find further application for *interior* use as markers for exits, guide lines, obstructions, etc., in public buildings, industrial plants, transportation systems, air raid shelters, ships and homes during power failure or blackout. For *exterior* applications, the potential usefulness of phosphorescent coatings is somewhat more limited because of the low visibility, as explained later. However, they may find some use on markers, directional signs, large obstructions, and for treating the clothing of pedestrians. The use of phosphorescent coatings in certain phases of camouflage work has been suggested. It must be emphasized that the larger the area painted, the greater the potential visibility and usefulness of these finishes.

It is difficult to make phosphorescent coatings comparable in appearance to ordinary paints because of the coarseness of the pigments, and the lack of color range both in phosphorescent and in visible light. Paints made with these pigments have poor flow; also rapid and hard settling. The Type B pigments must be protected from moisture by a clear film of vehicle, or a layer of glass or other transparent covering.

Phosphorescent coatings are used because of their afterglow. However, the intensity of this afterglow is quite low and its duration is limited, so that the coatings are not always so useful as is desired. The intensity of the afterglow, immediately after activation ceases, is between 1 and 10 per cent. of the fluorescent intensity during activation. Phosphorescent coatings are therefore useful only under conditions of extreme darkness and can generally be detected only when the eye has become adapted to the darkness.

When used *indoors* where conditions of complete darkness will exist, Type A materials can be seen by the dark-adapted eye for four to eight hours, have a moderate intensity for about two hours and can be readily perceived for one hour. Type B materials can be seen for about 24 hours, have a moderate intensity for about ten hours and can be readily perceived for three or four hours. When used *outdoors* their value in comparison with white coatings will be dependent upon the amount of visible light avail-

able. On a clear, moonless night, the amount of light from the sky is sufficient to illuminate a white paint to a brightness equal to or greater than that of most phosphorescent coatings. Only on extremely dark nights or in narrow streets, shadowed by high buildings, do such coatings show a higher brightness than that of a good white paint.

Phosphorescent coatings generally require an appreciable time of activation to come up to full intensity. In the case of Type A materials this time may be from ten seconds to a minute, and for Type B materials from one to ten minutes, depending on the intensity of the light source.

From the standpoint of durability, these finishes are quite permanent when used indoors. Experimental results have indicated that coatings made with Type A pigments, properly formulated, may retain more than seventy-five per cent. of their phosphorescent brilliance after nine months of outdoor exposure. Coatings made with Type B pigments are generally considered useful for not more than six months of exterior exposure.

A lowering of temperature will appreciably increase the length of afterglow and decrease its intensity.

Binders

The principal requirements of the binders (vehicles) used to make luminescent coatings are:

- 1—They should be pale in color, and transparent to ultra-violet and short wave-length visible light.
- 2—They should be practically neutral and non-reactive with the pigments and dyes. Even a low acidity may prove objectionable.
- 3—They should be non-yellowing on aging.
- 4—They should have a high degree of moisture resistance.

The binders may be either air-drying or baking types. Herewith is given a list of those which have been reported as having been successfully used.

Air-drying binders (vehicles):

- 1—Alkyds (drying oil type).
- 2—Cellulose nitrate and acetate.
- 3—Chlorinated rubber.
- 4—Dammar.
- 5—Highly polymerized drying oil with zinc resinate.
- 6—Maleic ester oleoresinous.
- 7—Methacrylate.

8—Polystyrene.

9—Vinyl resin.

Baking binders (vehicles):

1—Alkyds.

2—Melamine-alkyd.

3—Urea-alkyd.

For exterior use, binders with good durability characteristics should be chosen. Some alkyds and reduced phenolics may prove objectionable because of acidity.

Driers—Many of the binders used in luminescent paints require added driers to secure the desired drying. Metallic driers should be used in as small amounts as possible. It has been generally found that manganese is the safest drier to use; limited amounts of lead may be used with most luminescent pigments and dyes

without impairing their luminescent properties. Some authorities have found cobalt to be definitely injurious. All metals may be injurious to certain luminescent pigments and dyes, and consequently it is advisable to check carefully any drier combination to determine the effect on the luminescent properties of the finished coating.

Solvents—Most solvents commonly used in the paint and coating industry can be safely used in luminescent finishes. However, those solvents should be avoided that have an acid reaction or may decompose to form acids, such as some esters.

Packaging—Very little is known about the influence during storage of metal containers upon the luminescent properties of luminescent paints. The

★ SKILSAW SANDERS ★ give production the SPEED that leads to **ICTORY!**



• Minutes were never before so precious... and SKILSAW SANDERS never so important as they are today. That's why you'll find them in America's busiest war-work plants... right at the front in the battle of production.

6 SKILSAW DISC SANDER Models to speed up all sanding, cleaning, grinding on flat, concave or convex surfaces. 4 SKILSAW BELT SANDER Models to do all sanding and polishing on flat surfaces... 10 times faster than by hand. Ask your distributor for a demonstration.

SKILSAW, INC.
4765 Winnemac Ave., Chicago
New York • Boston • Buffalo
Philadelphia • Cleveland
Detroit • Indianapolis
St. Louis • Kansas City
Atlanta • New Orleans
Dallas • Los Angeles
Oakland • Seattle
Toronto, Canada

SKILSAW MODEL "SL" SANDER-GRINDER. Grinds down fins on steel castings, smooths down welding beads.

SKILSAW MODEL "B" BELT SANDER. Cleans up castings, speeds up sanding. Powerful vacuum system picks up all dust.

SKILSAW MODEL "N" DISC SANDER. Quickly removes fins and scale from gray iron castings. Buffs and polishes.

SKILSAW "ZEPHYRPLANE" BELT SANDER. Swiftly removes scale and grit from flat surfaces of metals, wood and compositions.

SKILSAW PORTABLE ELECTRIC TOOLS
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

safest known procedure is to use a can coated with baked finish or a glass container.

Activation (Light Sources)

Since fluorescent luminescent coatings have no appreciable lag, only black light with little or no visible light should be used as an activating agent. Suitable sources are mercury vapor, argon glow, fluorescent and incandescent filament lamps. They are generally used with filters to absorb most of the visible light.

Because the phosphorescent coatings continue to glow after the activator (light source) has been removed, a true black light is unnecessary. Any of the previous light sources without filters can be used as activators and, in addition, they may be excited by daylight.

Mercury Vapor Lamps—These light sources produce appreciable energy in the black light region and are the most powerful activators available. Because of their line spectra, the energy is more easily filtered to produce black light. The sizes available at present range from 100 watts up to 3000 watts. Each of these requires an individual transformer for satisfactory operation. This consideration may limit their use to more or less permanent mountings and certainly to A.C. circuits. Since mercury lamps require several minutes to warm up, they cannot be switched off and on rapidly.

Argon Glow Lamps—The commercially available argon glow lamps produce very little visible energy, but radiate an appreciable amount of invisible energy in the black light region. They may, therefore, be used with or without filters, depending on the degree of black light desired. These lamps, having low operating current characteristics and operating equally well on A.C. or D.C., may be adapted to operation from batteries and can, therefore, be considered quite portable.

Fluorescent Lamps—These lamps radiate an appreciable amount of black light and are efficient and effective activators. The 360BL lamps are made especially for the activation of fluorescent materials. They will, in general, be used with filters to absorb visible light. However, since these lamps give very little visible light and since they operate at relatively low wattages per unit area, it is not necessary that dark heat resisting glass be used as filter material. Pot blue

glass is quite suitable for this purpose.

For phosphorescent paints and coatings, the ordinary 3500° white, daylight and blue fluorescent lamps are very effective activators. The 360BL lamps may also be used if desired.

The linear characteristics of fluorescent lamps make them particularly adaptable to extended areas such as panel boards, signs, murals, etc.

Fluorescent lamps are basically A.C. devices. They require a reactor or current limiting device for each lamp or for each pair of lamps.

Special auxiliaries are available for the operation of fluorescent lamps on direct current. With them, however, the losses in the current limiting ballast are much greater than on A.C.

Filament Lamps—The amount of energy in the black light region produced by this type is small. Those such as the photoflood lamp, with filaments operating nearer to the melting point of tungsten and consequently with a much shorter expected life, produce the greatest quantities of active radiations. Since these sources are inefficient in the production of black light, it becomes necessary to use relatively high wattage sources. This necessitates the use of filters having high absorption in the visible portion of the spectrum as well as excellent heat resisting characteristics. However, filament lamps operate equally well on A.C. or D.C. and, therefore, are used where this consideration is of prime importance.

If a low intensity portable source of black light is required, a flashlight can be equipped with the proper filter.

Application

It is advisable to apply a white undercoat to surfaces to be coated with luminescent paints. Such undercoats should not contain metals or pigments which would be detrimental to the properties of the luminescent coating. It is advisable to apply two coats of luminescent coating to insure perfect coverage and maximum efficiency.

Since the Type B phosphorescent pigments and the fluorescent dyes are sensitive to moisture, it is necessary to apply a clear, pale finish coat which is transparent to ultra-violet and short wave-length visible light. It has been found that if a properly selected clear finish coat is used the efficiency of the luminous paint is not materially impaired. The clear finish also improves the washability of coating. The undercoat, luminescent paint and the clear finish can be applied by any of the well-known methods of application such as brush, spray, roller coating, dip, etc.

Methods of Test

The methods of test and evaluation of luminescent pigments are in need of standardization. The following specifications and tentative specifications describe test methods:

BS/ARP-18—British Standard Specification for Fluorescent and Phosphorescent Paint (excluding Radioactive Materials) for A. R. P. purposes, July, 1940.

BS/ARP-32—British Standard Specification for Illuminated and Non-ill-
(Continued on page 341)

ENTHONE RETARDER

Eliminates

LACQUER BLUSHING

During warm, humid days, lacquers frequently "blush" resulting in weak, unsatisfactory films.

Enthone Retarder has been used for 10 years to eliminate blushing and enable lacquering in the humid days of summer.

Enthone Retarder is easy to use, has wide compatibility and gives the lacquer better flow-out—thus reducing orange peel.

*Order Enthone Retarder NOW to be Ready
When Blushing Troubles Come.*

THE ENTHONE CO. NEW HAVEN, CONN.

Finishing Defense Products

PART III—Conclusion

By FRANK V. FAULHABER

Brooklyn, N. Y.

ALL material containers, incidentally, should be retained in spic-and-span condition. If transferring one material to another, the material container should be scrupulously cleaned; especially is this imperative when changing to or from lacquer, since, after using lacquer, the faucets of containers, whether air pressure or gravity pressure, will accumulate a small crust, formed by the composition remaining inside the faucet. Naturally this operating flaw will tend to retard the free flow of the finishing material.

Cleaning the Equipment

Continuous operation is best with this heavy lacquer, as it prevents drying in the nozzle. No difficulty is encountered where the machines are run on a three-shift basis. If a machine is shut down, it is important that the spray guns and fluid hoses be thoroughly cleaned by blowing thinner back through them, so that no hardened lacquer will cause leakage, dripping or stoppage.

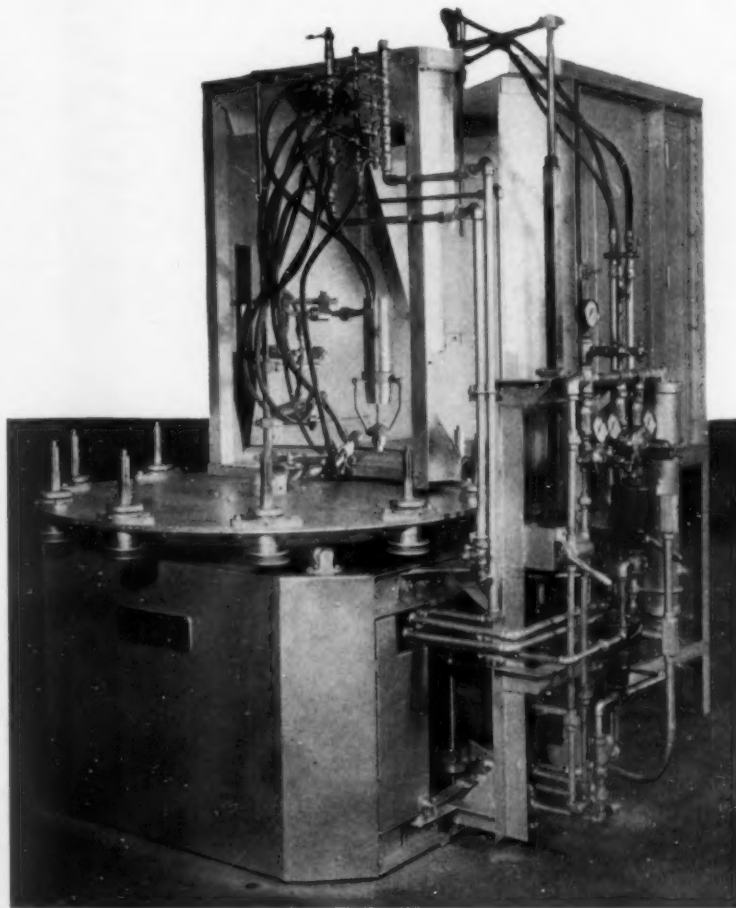
Preferably, a material hose should be carefully examined and tested, before any period of inactivity, lest any remaining material clinging in a thin film to its inner walls will dry, crack and flake off, later, when the hose is again placed in service. In some plants it is policy to fill the hose with turpentine, plugging up both ends, then leaving this material in the hose, overnight, next morning freeing the hose of this material, then attaching it to the airline. Religious observance of this practice ensures longer operating life for the hose, besides making for more efficient performance. Whenever the interior of a hose tends to peel, the advisable procedure is to provide a new one.

It is, in fact, foresighted policy to clean the material hose at the end of

a day's work, if not successively used, an appropriate cleaning liquid being permitted to run through until it is completely cleaned. After thus cleaned, it may be dried by connecting it to an airline and letting compressed air circulate there through. Unused hose thus may then be laid out in a straight line, where it will not be interfered with, to avoid dents, kinking, crevices and other disintegration as so often happens when a hose is carelessly thrown any convenient place or hung to twist all out of shape.

Finishing Shells

As with many another industrial product under finish, the spray method has proved the most practical and most expeditious for the purposes of finishing shells and other munitions. Only by means of the spray apparatus can proper coatings be applied with the speed and uniformity that is essential in the manufacture of shells. Naturally, the type and condition of the spraying equipment must be considered when undertaking any kind of this work, the quantity, size of shells, as



Equipment for automatic coating of interior and exterior of shells.

(Courtesy, The DeVilbiss Co., Toledo, Ohio)

also the plant's layout and other operating facilities.

The finish on the interior of shells is usually sprayed with an acid-proof black manufactured to meet U. S. specifications. Some British shells are coated interiorly with Copal varnish. The exterior application is one of various colors, although yellow is probably the most frequently in use. Exterior finishing material is also manufactured to meet Government specifications. Tail pieces are often finished with brown lacquer or enamel, and zinc chromate is commonly applied to the exterior of bombs. The bomb exterior is usually painted with an acid-proof black.

The range of spraying procedure comprises three different methods, depending upon size and output of the plant. The hand spray system is in force where the volume of parts to be coated is small, or where the parts are of such size that the speed of automatic spraying is not justified. This is true of both interior and exterior coating.

The *modus operandi* is to truck the smaller shells to the coating position, where these are affixed onto a horizontal rotating mechanism. Initially the shell is coated innerly by aid of a spray gun equipped with an extension nozzle. The gun is inserted to the proper depth, through the opening in the shell, the trigger of the gun depressed, and while spraying, the gun is withdrawn as the shell rotates. The result is a uniform, thorough application on all surfaces within the shell body.

Controlling Operation

To steady the insertion of the spray gun nozzle, a holding device is generally used. This maintains the proper relation between the spray gun nozzle and the inside wall of the shell, as well as determines the length of the stroke. When using this holder and carriage, it is necessary only to insert the gun nozzle to stop position, pull the trigger and withdraw. This simple method is capable of coating the interior of 125 to 150 3.7 shells per hour. Length, diameter and weight of shell naturally affect handling and spraying time.

Heavier shells fed by gravity conveyor may be revolved at spraying position on a rotating conveyor sec-

tion which simplifies and speeds handling.

Once the interior of a shell is coated, it is set vertically on a hand or mechanically operated turn-table and sprayed as it revolves. One stroke of the gun, from the top to the bottom of the shell, uniformly coats all exposed surfaces. Guards, shields, masking bands or plugs are employed for the protection of such shell areas not to be painted.

The exterior of 1000 and 2000 pound aerial bombs are also spray-painted manually. The bombs suspend from an overhead conveyor, passing through the painting department. At the first operation the bottom and about $\frac{2}{3}$ up the side of the bomb are sprayed. At the next spray station a second operator finishes the sides, top and tail piece.

For the painting of exterior of shells of 155 mm. and up, a semi-automatic spray method is sometimes the arrangement. Following the spraying of the interior, the shell advances, via conveyor, to the exterior spraying operation. At this point, some semi-automatic spray guns are mounted to cover all exposed areas with one blast of spray. Three guns are opened and closed by means of an air-actuated valve controlled by the operator. As each shell comes within the spraying range of these guns, the operator, through the manipulation of a single hand lever, starts and stops the spray.

37 to 155 mm. Shells

Wherever shells from 37 to 155 mm. are produced in large volume, the spray coating is done by automatic equipment. Completely automatic machines, which coat both interior and exterior of shells of this size, are being used by practically all the large manufacturers who are now engaged in large volume shell production.

The method is to insert shells in a combination work holder and shield, which in turn is placed on revolving spindles located at the edge of the machine's rotating table. This table automatically conveys the shell to the interior spraying position. Here the shell's forward motion is halted until an overhead extension gun enters the revolving shell, sprays its interior and then withdraws. As the gun reaches its "out" position, the table moves on to the exterior painting position. Here

two or more automatic guns are mounted in fixed position to spray all exposed exterior surfaces of the revolving shell while it is within spraying range.

While this exterior coating is taking place, the interior of another shell is being coated also. The two operations in two different positions are processed simultaneously. Start, stop and duration of spray are automatically controlled. At the termination of the exterior spraying operation, the shell and work holder are lifted from the spindle, the shell being removed from the work holder and placed on a conveyor which transfers it to the inspection and packaging section.

It is interesting to note that a 76 inch diameter table machine containing 72 spindles for 37 mm. shells has a coating capacity of 1000 shells an hour. With a 42 inch table machine incorporating 20 spindles for 60 mm., 81 mm., short or long, 81 mm. plus adapter and tail assemblies, the coating output is 720 units per hour. Then, with a 42 inch table machine, comprising 10 spindles for 75 mm., 90 mm., 90 mm. plus adapter, 105 mm., 105 mm. plus adapter and the 20 pound fragmentation bomb, the coating production represents 300 shells per hour.

Operating Technique

On such spraying equipment the spindles are mounted on ball bearings and the surface which contacts the work holder is hardened. The mechanism which controls the spray gun is operated by the spindle so that the spray gun will open only when a loaded spindle enters the spray station.

At the exterior spray station the automatic guns are mounted stationary, but are adjustable for angle and height. Movement of the gun at the internal spray station is actuated through a lever by a drum cam. Positive synchronization of cam and table drive eliminates any possibility of mechanism failure which would cause damage to the moving gun.

For topmost efficient production in the finishing of shells and kindred products an appropriate paint-circulating system is a requisite. A paint circulating system comprises a tank, a pump to draw paint from the tank, and a pipe line from the tank to the spray booth and back to the tank. For best working performance, however, additional equipment is necessary.

Whenever a fluid is pumped through a pipe, the pressure in that line is different at every point. A cardinal essential naturally, is a fluid pressure regulator on the system at each juncture where finish is to be applied, for the purpose of equalizing the pressure at each outlet, or to ensure the correct reduction from the main line pressure. Present-day fluid pressure regulators are so sensitive that there is almost no perceptible variation in the regulated pressure when the spray gun is opened.

A removable key controls the pressure, and an incidental feature is afforded for use when blowing back the paint hose. These two integrals operate individually, permitting supervision by the department head and to determine whether correct operating pressure is being maintained. This is important, where personal quirks of some operators may cause unwise manipulation of the apparatus to the detriment of the finishing.

Paint Circulation

Particularly in shell and similar Defense production it is meet that the velocity of the paint circulating through the lines be given due attention. Whenever the finishing liquid is pumped through at the correct speed, the troubles of possible precipitation of solids in the lines will be averted, this negation tending to off-color finish. However, when a velocity greater than essential is maintained, an undue pressure is placed on the apparatus, conducing towards higher overhead.

In selecting the proper pipe line, size and capacity, vital elements to be borne in mind are the proper linear flow, paint velocity and the length of the lines.

When the paint circulating system is methodically arranged, the problems of cleaning the apparatus become negligible. Most attention is required at the time when a change is made to another paint or at the conclusion of a working period when operations cease. Convenient connections are included in a paint circulating system to facilitate pumping of thinner through the lines and pumping out the air.

For the purposes of purifying the paint coursing through the line, a filter is attached on the discharged side of the pump. This filter can be cleaned while the apparatus is in operation and without removing from

the line. There are various kinds of filters, sized for the particular finishing liquid in use.

A throttle valve is part of the return line, to permit a raise of pressure on the line when desired. Depending on the fluid pressure necessary at the gun, and the proximity of the last outlet or fluid pressure regulator to the return and of the line, governs the pressure which should be maintained on any circulating line.

Hydrostatic Gauges

For most purposes, each line is equipped with two tanks, these being piped, so that the finishing material can be pumped to the line from either tank and resorted to either tank. Thus it is possible to prepare a new batch of material in one tank while another batch is being circulated from the second tank, without time-loss.

When equipped with hydrostatic gauges, these tanks permit accurate control over paint velocity, and the material can be mixed on a weight basis instead of by volume. Thus correct mixing and continuous agitation of paint at all times are afforded.

By means of a paint circulating system better uniformity of finish is possible, since the same finishing liquid can be circulated through all spray booths in a completely closed system, reducing the hazards of variation and possibility of dirt contamination.

Salient points represented by a proper paint circulating arrangement are that it obviates the necessity of manual handling and conveyance of the paint to and from booths, meets rigid insurance company regulations, reduces the fire hazard, saves paint and labor otherwise entailed in cleaning used containers, and provides more agreeable operating conditions.

Additional salutary features are that the paint can be transmitted directly to spray booths by way of a totally-closed pipe line layout, the greater proportion of paint being retained in storage tanks in a fireproof mixing chamber, only a little over two gallons per 100-ft. of $\frac{3}{4}$ inch pipe actually being in circulation; it reduces retardation of output otherwise attendant when there is variation in color of finish; the run of work is more uniform by reason of cleaner paint and since the viscosity of the liquid, once established, can be controlled in the mixing department; and reduces floor space requirements to a minimum.

Also, it is not necessary, with a paint circulating system, to furnish, maintain and clean pressure tanks and refill tanks, thus also economizing on paint hose and thinner required with the older methods. Operators prefer it, because it affords easy and accurate control pressure of the gun, which contributes considerably in objectifying for a uniform film coating.

Uniform Volume

Inasmuch as it is possible to prepare larger mixes of material, it lessens also the tendency of off-color work. Finishing room foremen too frequently are beset with this undesirable color variation, occasioned oftentimes by the repeated necessity of preparing small mixes. The paint circulating system methodizes the production schedule more efficiently, from all angles, since the flow of paint, unchangingly, is available at the spray booths more consistently, without its repeated necessity for attending to a long run of irritating and disconcerting details, as attends when operating under a retardive production program.

Naturally there are divers factors bearing on successful finishing of shells and other Defense products. In large scale output, the more modern and inclusive the operating equipment, competently and faithfully controlled, the more uninterrupted the flow and the more uniform its quality.

LUMINESCENT COATINGS

(Concluded from page 338)

uminated A. R. P. Signs, British Standards, Institute, May, 1940.

Lacquers, Fluorescent—Instrument Marking. Air Corps Specification No. 14102, June 26, 1940.

Markers, Fluorescent—Instrument Identification and Range. Air Corps Specification No. 17012, July 19, 1940.

Paint, Luminous Nonreactive—Rock Island Arsenal. Tentative Specifications RIXS-122—Rev. 1, January 24, 1941.

Committee: Major Peter Rodyenko, Austin O. Allen, Eugene W. Beggs, Guido Henry, Samuel Hibben, Carlton Rose, Frederick C. Schmutz, R. A. Shive, George F. A. Stutz, Robert J. Moore,* Ex-officio; Joseph J. Mattiello, Chairman.

Reprinted from "Official Digest", Federation of Paint and Varnish Production Clubs.

*General Chairman of the Technical Committee of the New York Production Club.

YOU WILL NEED

the

APPROVED WAR FINISHES

PAYSON—Approved at Holabird for the baked and air-dried paint and enamel finishes you will be using—

Specialists in

★ **WRINKLE FINISHES** ★

... Olive Drab ... Black ... etc.

... White Synthetics

... All Specification Paints

It Pays To Patronize a Specialist

WRITE, WIRE OR PHONE

PAYSON PAINT & VARNISH CORP.

804 EAST 141st STREET

NEW YORK, N. Y.

Phone: MEIrose 5-4920

Agateen LACQUERS

All types of Clear Lacquer for Metals

BUFFING

LACQUER

for Cloisonne Reproductions

Air-Dry Priming Lacquer

Water Dip Lacquer

Elastic

Non-blushing

Agate Lacquer Mfg. Co., Inc.

11-13 Forty-third Road

LONG ISLAND CITY, N. Y.

Agateen—The Last Word in Quality

New Equipment

Lacquers for "Black Plate"

The Watson-Standard Co., Pittsburgh, Pa., announces the development of a series of lacquers especially adapted to the conversion from tin or terne plate to "black plate". These new lacquers developed over a period of several months, are claimed to have unusual properties of adhesion to the black plate, and prevent under-film corrosion. The new series includes lacquers developed to withstand processing for home canning. The lacquers can be made in metallic colors.

Safety Solvent To Replace Naphtha, etc.

The Research and Development Laboratory of The Curran Corporation, Malden, Massachusetts has just recently developed a new hand-wiping safety solvent which is to be marketed as a safety replacement for naphtha, gasoline, and kerosene in removing cosmoline out of rifles issued to troops.

According to Mr. A. F. Curran, Research Director, the new solvent is also applicable for wide industrial use as a naphtha substitute for grease cleaning and hand-wiping

operations in ordnance factories or shell plants.

The new solvent is to be marketed under its blanket trade-mark of, GUNK XP-92; to be used as a concentrate and to be diluted with water.

This new solvent is described by the company as a unique safety solvent because in spite of its high solvency against mineral oil or dirt, it does not de-oil the skin, has no toxic vapors, high flash or fire point, and leaves an invisible rust preventative film.

Automatic Airpainting Unit for Coating 40 mm. Shells

An airpainting unit for coating interiors and exteriors of 40 mm. shells is being manufactured by the Paasche Airbrush Co., 1909 Diversey Parkway, Chicago, Ill. Production on a machine like that shown is 1,920 pieces per hour with 2¼ minutes drying time. However, variable speed drives permit increase or decrease in production or drying time, and conveyors are supplied in sizes to meet any requirement.

Shells are conveyed to coating stations on revolving spindle assemblies mounted on steel roller chain, and are held by combination holding and shielding fixtures. A hollow shield also protects threaded portion on interior from paint. Holding fixtures are interchangeable so shells of different sizes and types can be accommodated. Spindles, set at 3" centers, are removable.



Equipment for automatic air painting of 40 mm. shells.

The interior of the shell is coated first by airbrush which is automatically oscillated following the shell while spraying interior surfaces. This feature is claimed to assure complete uniform coverage and a maximum of savings in material. The work continues to the exterior coating station and then through infra-red drying section.

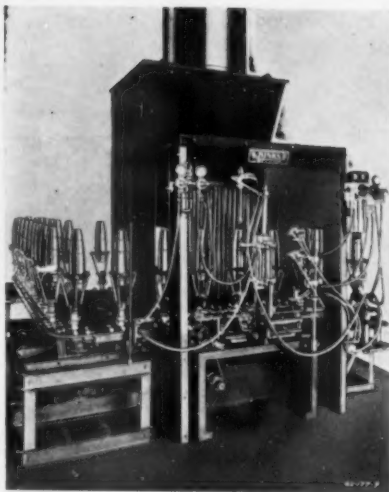
A water wash exhaust booth is provided to accommodate both spraying operations and assure a maximum degree of safety. Features of this booth are also said to eliminate the usual manual cleaning, thus saving considerable time and maintenance. The automatic airpainting unit is complete and

includes infra-red drying unit, exhaust unit, centrifugal pump with water wash booth, automatic airbrushes, water, oil and dirt separator and pressure feed material tanks. Frame is of heavy pressed steel, 9' 5" long, 4' 11" wide and 2' 6" high.

Automatic Shell Coating Machine

Binks Mfg. Co., 3114-40 Carroll Ave., Chicago, Ill., have announced the development of a new automatic shell coating machine. The illustration shows a typical machine for spraying the inside and outside of 75 mm. to 105 mm. shells automatically, at the rate of 200 to 500 per hour.

The shells are loaded on a moving conveyor in a specially designed workholder which holds them in place. As these pass in front of the company's water wash spray booth, an oscillating mechanism engages the spindle of the workholder, rotating the shells in front of the automatic spray guns, which spray the exteriors. The shells then pass,



Equipment for coating
75-105 mm. shells.

still rotating, to the position where a pneumatic spray gun plunges down into the interior cavity of the shell as it rotates, completely spraying the inside, it is reported.

The shells then pass away from the oscillating mechanism and continue on the conveyor for the required time to complete an air dry. They are then unloaded and packed for shipment to the shell loading plants. The unit is equipped with an ingenious device known as a "Skip Spray" unit, which is so designed that should a shell be missing on the conveyor, the gun will not spray. Thus no paint is wasted or lost.

Any manufacturer who is interested in a quotation on automatic equipment should advise the size of shells or other parts to be sprayed and the required hourly production. With these two points of information, a complete formal quotation can be made. Address Automatic Division of the above company.

Manufacturers' Literature

Government Specification Finishes

A booklet on U. S. Government Specification Finishes has been published by *Maas & Waldstein Company*, makers of industrial finishes, Newark, New Jersey. The booklet provides makers of armament products with essential information on M&W finishes that have been made to conform with various U. S. Government specifications. Copies will be sent, on request, to engineers, purchasing agents, and others requiring this information.

Substitute Enamel

The Sherwin-Williams Co., Cleveland, Ohio, have announced the development of an enamel called "A" Lustral enamel, which was designed to fill the gap left by priority restrictions on the company's "Kem Lustral" enamel which can now only be obtained by priority. The new product is stated to be suitable for either indoor or outdoor use and can be applied by brushing, spraying or dipping. It is available in a wide variety of colors.

A new color card has also been issued on the company's "B" Lustral enamels, which are stated to be more economical than the "A", but are recommended primarily for interior use. At the present writing, both enamels can be supplied on non-priority orders.

Metal Cleaning

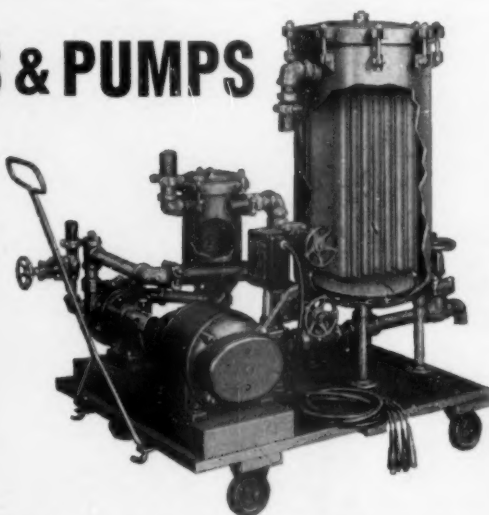
Solving Metal Cleaning Problems—A brief description of the methods used in solving industrial metal cleaning problems is contained in an illustrated leaflet issued by Detroit Rex Products Company, 13005 Hillview Ave., Detroit, Michigan. It shows their research, engineering and manufacturing facilities for production of degreasers, washers and chemical cleaners.

Charles A. Greene has become associated with *Paint Engineers, Inc.*, Hawthorne, N. J. Mr. Greene was formerly vice-president of Valentine & Co., and has been connected with the paint industry for many years. He has also made research undertakings in oils in recent years. Robert E. Mitchell is president of Paint Engineers, Inc.

FILTERS & PUMPS

For Filtering, Pumping,
or Circulating:—

ELECTROPLATING
SOLUTIONS
DEGREASING
SOLVENTS
CLEANERS
OILS
COOLANTS
LACQUERS
KEROSENE
VARNISH
ALCOHOL &
OTHERS



We carry a large stock of Filter & Pump accessories, hose, valves, fittings. All grades of filter cloth, filter aids, & FILTERBESTOS. Ready for shipment.



SALT SPRAY CORROSION TEST EQUIPMENT

Designed to determine the corrosion resisting qualities of plated or coated metal, alloys, metal parts, organic finishes, etc. This equipment combines necessary features so that Salt Spray tests can be conducted to specifications at Controlled Temperatures to 130 Deg. Fah.

"Write for New Literature and Particulars"

INDUSTRIAL FILTER & PUMP MFG. CO.
3017 WEST CARROLL AVENUE CHICAGO, ILLINOIS

Leaders in Favor-

FOR WEARABLE PROTECTION



against HARMFUL METAL FINISHING DUSTS!

M.S.A.

Dustfoe

RESPIRATOR



No interference with working freedom, goggles or any head covering.

The favorite dust respirator of metal finishers who prefer compact design *plus* easy wearing comfort *plus* approved protection. The Dustfoe also features completely interchangeable and replaceable parts. Safe protection is provided by the M.S.A. "All Dust" filter—officially approved by the U.S. Bureau of Mines—wearing ease is

assured by the cushioned facepiece and foolproof exhalation valve. Protective filter cover prevents grease and dirt from contacting filter—the Dustfoe may be cleaned and sterilized without harm by ordinary methods. Write for Bulletin No. CM-5.

M.S.A.

Comfo

RESPIRATOR



This sturdy M.S.A. Respirator enjoys top popularity for *All Dust* protection, combined with notable comfort and ability to take hard service without harm. Side-placed, protected twin filters are attached to flexible molded facepiece, which fits any face snugly and comfortably—the Comfo may be folded flat without injury and carried in coveralls pocket or tool box when not in use. U.S. Bureau of Mines-approved for complete dust protection—easy to keep in sanitary condition. Ask for Bulletin No. CR-3.

EVERY M.S.A. Dust Respirator carries the approval of the United States Bureau of Mines—official governmental testing agency. We manufacture only approved dust respirators.

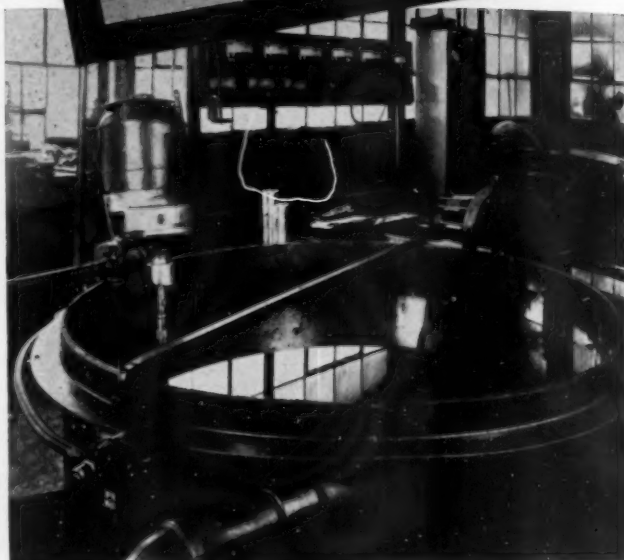
MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS AND MEADE STREETS
PITTSBURGH, PA.

District Representatives in Principal Cities

WHEREVER AGITATION IS necessary . . .

"LIGHTNIN" Mixers Save Labor and Save Current In: Tinting and Coloring—Thinning or Replenishing—Cutting Shellac, Varnish or Synthetic Resins—Varnish Cooking—Keeping Pigments in Suspension—Preventing Settling in Dipping Tanks. Also used in cleaning and plating tanks, etc.



Today when it is absolutely necessary to get everything possible out of existing equipment, and a little more too, many firms like yours are ordering "LIGHTNIN" Mixers. Their easy portability and their adaptability to such a wide variety of production problems plus their many economies speed production where speed counts. Send for Catalog B-65 and a Mixing Work Sheet for a recommendation and quotation by return mail.

MIXING EQUIPMENT COMPANY, Inc.

1061 GARSON AVENUE ROCHESTER, N. Y.

Mixing Equipment Company, Inc.
1061 Garson Avenue
Rochester, N. Y.

Please send me:

..... Catalog B-65—Portable Mixers

..... Mixing Work Sheet

Name

Title

Company

Address

METAL FINISHING, June, 1942

METAL FINISHING

Founded as METAL INDUSTRY,
January, 1903 by
PALMER H. LANGDON
1868-1935

VOLUME 40

JULY 1942

NUMBER 7

Publication Office:
116 John Street, New York



L. H. LANGDON
Publisher

THOMAS A. TRUMBOUR
Business Manager

DR. WALTER R. MEYER
Editor

PALMER H. LANGDON
Assistant Editor

JOAN TRUMBOUR
Advertising Manager



PUBLISHED MONTHLY—Copyright 1942 by The Metal Industry Publishing Company, Incorporated, 116 John St., New York, N. Y. Entered February 25, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879. Re-entered as second class matter June 13, 1940, at the post office at New York, N. Y., under the Act of March 3, 1879.

SUBSCRIPTION PRICES: United States, \$2.00 per year; Canada, \$2.50 per year (includes 50c exchange and tax). Foreign \$3.00. Single copies 25c. Please remit by check or money order; cash should be registered.

ADVERTISING RATES on application. Forms close the first of the month. Advertising copy should be mailed in time to reach us on or before the 20th of the preceding month.

METAL FINISHING reserves the right to investigate all products offered for advertisement, to refuse advertising considered unsuitable and to edit advertising copy when necessary.

CONTENTS

Editorial	347
Annual A.E.S. Convention	349
Salt Vital to Worker	354
Hard Chromium Plating—By Austin Fletcher	355
Flexible Molds—By Samuel Wein	359
A Comparative Study of Oils for Supplemental Protection of Black Oxide Coatings on Steel—By E. A. Parker and A. K. Graham	363
Near Infra-Red and Metal Finishing—By Paul H. Krupp	389
Flame-Priming Steel for Painting	395

DEPARTMENTS

Shop Problems	365
Patents	368
This is Washington	369
New Equipment and Supplies	373
Manufacturers' Literature	375
New Books	378
Obituary	379
Communications	380
Business Items	381
Supply Prices	35
Post Scripts	40

RELEASE OF FRONT COVER—The Hanson-Van Winkle-Munning Co., Matawan, N. J., has kindly released the front cover ad of this issue to allow the publication of the American Flag in keeping with the practice of all national and business publications.

LEA

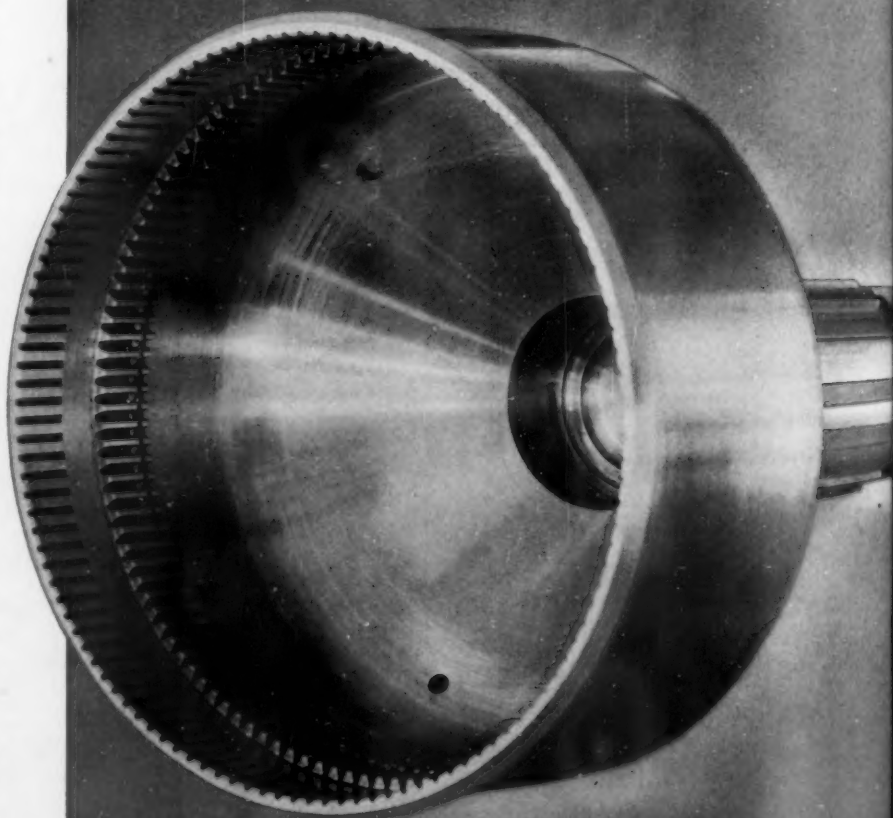
POLISHING *and* BURRING METHODS FOR WAR INDUSTRIES

Simple • Cost-Reducing • Time-Reducing • Tolerance-Protecting

LEA Technicians took to the polishing and burring problems of the war industries as a duck takes to water. For many years, their contribution to peace industries has been efficient and economic polishing methods—which fundamentally mean "removal of metal". Since the removal of burrs also involves the "removal of metal", it was only natural that their offer of service was doubly welcome to the war industries.

That hundreds of plants working on airplane parts, ordnance, instruments, and other vitally needed war equipment have adopted the Lea Methods of Polishing and Burring is a tribute to their effectiveness and economy.

Write us in full about your problems on polishing and burring operations. We have the special bobs and wheels, and the special compositions. On your burring problems, particularly, the Lea Method should eliminate the need for hand filing, emery cloth wiping, rolling, or burring tools.



Typical of parts on which Lea Polishing and Burring Methods are used

THE **LEA** MANUFACTURING CO. WATERBURY, CONN

Burring, Buffing and Polishing • • • Specialists in the Development of Production Methods and Compositions

Metals Situation Tighter

The issuance of new orders by the war production board indicates the increasing shortages of metals. Zinc was formerly one of the relatively free metals with a certain quantity being set aside each month for war purposes. The zinc pool requirements continued to increase each month and on May 1st the WPB decided to insure the availability of the war requirements for zinc, and General Preference Order M-11 was issued placing the supply and sale of zinc under allocation.

No restrictions have been placed as yet on zinc plating but the allocation system controls the obtaining of zinc for plating or other purposes. The situation for zinc is somewhat similar to that for chromic acid used in plating. The manufacture of chromic acid used for plating, anodizing and other purposes is restricted to 80% that of a previous base period but the supplies appear to be ample to take care of requirements of the finishing industry. There is no restriction on chromium plating.

Steps are being taken to prevent the Axis from getting much needed platinum. There is a good supply of platinum in the U. S., thanks to the productive Canadian mines. Order M-162 requires a filing of a special form by all possessing one or more ounces of platinum, and dealers in platinum must file a special form.

The metal situation will become progressively tighter and there will probably be much tighter restrictions or banning of iron and steel in many hundreds more of non-war goods still being made.

The abundance of high priority ratings has led to announcement of provision for higher ratings than A-1-a. The new ratings will be AAA, AA-1, AA-2, etc., all of which will take preference over A-1-a ratings.

Great Interest in Finishing at A.E.S. Meeting

A study of the registration statistics of the Grand Rapids Meeting of the A.E.S. showed a good attendance of technical men or finishing executives. At the immense Boston meeting in 1941, there were 323 finishing "executives" and 189 supply house representatives. At Grand Rapids in 1942 there were 274 finishing "executives" and 149 supply men, a drop in attendance of 49 executives. There was actually a gain in the ratio of finishing executives to supply men at Grand Rapids.

The purpose in mentioning these statistics is to indicate that even in war time, plant managers think it worthwhile to send their busy chemists and platers to technical meetings.

Unless the war picture changes radically, the Buffalo Branch of the Society should proceed with plans for the 1943 meeting with expectations for a successful meeting.

New Book on Plating

The recent publication of "Modern Electroplating" by the Electrochemical Society has filled a need for an up-to-date book on electroplating. While not strictly a textbook such as "Principles of Electroplating" by Blum and Hogaboom, "Modern Electroplating" presents a comprehensive study of electroplating. The book consists of articles on almost all types of plating solutions written by specialists. An excellent chapter on theory of plating serves as an introduction. The many references in the text are valuable for further study and discussions of each paper add to the wealth of information. The papers were presented at the 1941 Fall Meeting of the Electrochemical Society at its "Symposium on Electroplating."

VICTORY LUNCHEON HELD AT CONVENTION

A new feature of this year's convention was the Victory Luncheon held Tuesday noon and attended by practically all the men registered. The Host on this occasion was the Frederick Gumm Chemical Co., and the speaker, Dr. Alfred P. Haake, Chief Economist for the American Economic Foundation. Dr. Haake's talk was very well received, and he answered a number of questions afterward. His subject was

"We
Must
Win
the
War,
but
How?"

Top left
Dr. Alfred P. Haake

Top right: Speakers'
Table. Left to right:
Frederick Gumm, host,
Ellsworth Candee, Pres. of
A.E.S., Dr. Haake, speaker
and Chester Smith, General
Convention Chairman.

A.E.S. 30th Annual Meeting

THE 30th Annual Meeting of the American Electroplaters' Society, held at Grand Rapids, Mich., June 8, 9 and 10th, was decidedly successful with 533 registrants. The most outstanding aspect of the convention was the intense interest in the technical papers presented, particularly those pertaining directly to war work.

On Monday, the members had the opportunity to hear various Washington representatives of the War Production Board. These included *Wm. McCord*, *Harvey A. Anderson* and *George B. Hogaboom*. In addition, *Dr. Wm. Blum* of the National Bureau of Standards, discussed "Military Applications of Plating". The information pertaining to war finishes was amplified by the paper of *E. R. Erwin* and *Lieut. J. Teres* of Wright Field, Dayton, Ohio. *Lieut. Teres* was besieged by platers after the meeting who were interested in the many problems pertaining to finishing for the aircraft industry.

From a technical standpoint, most of the registrants considered the paper by *Harold Ransburg* entitled, "Electrodepositing Paint Spray" to be one of the most interesting and novel to be presented for a long time, and in fact, the Awards Committee selected this paper for the *Herminie Dorothea Proctor Award* of \$100.

Most agreed that the outstanding event of the meeting was the Tuesday noon luncheon, at which time, *Dr. Alfred P. Haake* spoke, his subject, being "We Must Win the War, But How?" All present were deeply stirred by *Dr. Haake's* masterful presentation of his subject.

Election of Officers

The vice-presidents of the year 1941-1942 were elevated one step in rank and thus, *Charles C. Conley*, plant



Charles C. Conley
Supreme President



Maurice R. Caldwell
Supreme 2nd Vice President



George Wagner
Supreme 1st Vice President



Clarence C. Helmle
Supreme 3rd Vice President

manager of the *Stolle Corp.*, *Sydney, Ohio*, was elected Supreme President; *George Wagner* of *Hv-Grade Electroplating Co.*, *Newark, N. J.*, was elected First Vice-President and *Maurice R. Caldwell*, chemist of *W. B. Jarvis Co.*,

Grand Rapids, Mich., was elected Second Vice-President. *Clarence C. Helmle*, electrochemist of *General Electric Co.*, *Bridgeport, Conn.*, was elected Third Vice-President. *Ellsworth T. Candee*, *Metal Hose Branch*,





Wm. J. R. Kennedy
Executive Secretary

American Brass Co., Waterbury, Conn., is the retiring president and *W. J. R. Kennedy* of Springfield, Mass., remains the Executive Secretary. The Society, therefore, has two officers from the Mid West and two from the East. All of the men are extremely popular and capable, possessing excellent technical and practical knowledge of electroplating.

Convention City

The Buffalo Branch was awarded the convention for 1943. It is too early to state definitely that the 1943 convention will be held. However, at the present writing, it is the intention of the Society to hold a 1943 meeting, especially in view of the decidedly successful nature of the Grand Rapids meeting.



Wm. M. Phillips
Co-winner with Frank Clifton of Founders' Gold Medal



Wm. M. Cole
Chairman, Int. Fellowship Club



Frederick Gumm
2nd Vice Chairman, Int. Fellowship Club



Thomas A. Trumbour
Permanent Secretary



Charles Schlott
1st Vice Chairman, Int. Fellowship Club

Prize Awards

The Committee on Prize Awards made excellent choices for the various recipients of prizes. These awards were as follows:

THE HERMINIE DOROTHEA PROCTOR AWARD OF \$100

Awarded to *Harold Ransburg*, Harper J. Ransburg Co., Indianapolis, Ind., for his paper entitled, "Electrodepositing Paint Spray".

FOUNDERS' GOLD MEDAL

Awarded to *Frank Clifton* and *Wm. M. Phillips*, General Motors Corp., Detroit, Mich., for their paper entitled, "Bright Copper Plating in Acid Baths".

Honorable Mention—*Carl E. Heusser*, Chrysler Corp., Detroit, Mich., for his paper entitled, "Comparative Tests of Ocean Water Spray vs. Standard Salt Spray".

FIFTY DOLLARS PRIZE FOR BEST PAPER IN THE MONTHLY REVIEW

Awarded to *Manuel Sanz*, Vultee Aircraft, Inc., Downey, Cal., for his paper entitled, "Chromic Acid Baths for Anodizing or Chromatizing Aluminum or Its Alloys".

A.E.S. GOLD MEDAL

Awarded to *Frank K. Savage*, C. G.





Frank K. Savage
Winner of A.E.S. Gold Medal

Conn Ltd., Elkhart, Ind., for his paper entitled, "Useful Applications of Bipolarity in Practical Plating".

Honorable Mention—*Wm. Tucker*, Eastman Kodak Co., Rochester, N. Y., for his paper entitled, "Technique of Heavy Nickel Plating".

International Fellowship Club

The activities of the International Fellowship Club were decidedly successful. The Club sponsored the Open House meeting held Monday night, and 118 organizations engaged in selling and manufacturing plating equipment and supplies, contributed to the meeting.

The attendance at the Annual Luncheon held Monday noon was the largest ever, with 87 members present. At the luncheon, officers for 1942-43 were elected. The elections were: *Charles Schlott*, Egyptian Lacquer Mfg. Co., New York, Chairman; *Wm. M. Cole*, J. B. Ford Sales Co., Wyandotte, Mich., First-Chairman, and *Frederick Gumm*, Frederick Gumm Chemical Co., Kearny, N. J., Second Vice-Chairman. *Thomas A. Trumbour* was continued in office as Permanent Secretary. In appreciation of Mr. Trumbour's many years of continued and valuable service, he was presented with a traveling suitcase. The presentation was made by retiring chairman, *Richard Crane* of Lea Mfg. Co., Waterbury, Conn.

Photographic Exhibit

There were some surprisingly ex-

cellent photographs at the First Annual Photographic Exhibition held at the meeting. The awards were as follows:

Manufacturers' Photographs of Equipment and Processes

1st—*Hanson-Van Winkle-Munning Co.*, Matawan, N. J.—"Modern low voltage generator under construction."

2nd—*The Metalcraft Co.*, Cincinnati, Ohio. (photo by *Harry Misner*)—"Polishing Department".

3rd—*The Max Woche & Son Co.*, Cincinnati, Ohio. — "Assembling Microscopes", and the "Mont R. Reid Operating Table".

Plated Parts

1st—*Hanson-Van Winkle-Munning Co.*, Matawan, N. J.—"Modern hot galvanizing coat adhesion".

2nd—Same company. "Another aspect of the adhesion".

3rd—Same company. "Semi-automatic nickel conveyor".

People and Activities

1st—*K. Schumpelt*—"Child and dog sequence".

2nd—*Charles Macauley*—"Stairway Ballet".

3rd—*Robie Macauley*-Peter Taylor

Landscapes, Outdoors

1st — *K. Schumpelt* — "Fat and Skinny".

2nd—*W. L. Cassell*—"All's Quiet".

3rd—*W. L. Cassell*—"Perfection".

Honorable mention — *Charles Dutchess*: "Home Town Atmosphere".
W. L. Cassell—"Cool Waters".



Wesley L. Cassell
Winner of several awards in photographic competition

Hobbies and Tabletops

1st—*C. Macauley*—"Watch".

2nd—*C. Macauley*—"Mephisto".

3rd—*C. Macauley*—"Bel Paese".

Still Life

1st—*C. M. Douglas*—"Due to Be Cleaned".

2nd—*C. Macauley*—"Tradition".

Animals

1st — *Charles Macauley* — "Spring Turning".

2nd—*Wm. E. Kerr*—"Expectancy".

3rd—*W. L. Cassell*—"OK Shoot".

Past Convention Pictures

1st—*C. M. Douglas*—"Off to an AES Meeting".

2nd—7th AES convention photo.

3rd—Newark Branch Display.

Honorable Mention—*Chas. O. Werft* exhibit.

Dr. Karl Schumpelt (left). Shown in an informal picture with *Louis V. Gale* of Boston. Dr. Schumpelt won two first place awards in photographic competition.



Salt Vital to Worker

Workers in Hot Weather Need Extra Salt to Maintain Productivity

THE hot season is ahead—the season when, in the past, workers have wilted and production curves sagged under an oppressive summer sun.

But this year American industry is engaged in a grim, Titanic struggle to overtake and overwhelm the long war production lead of the Axis powers. There can be no summer slump. Time is of too much importance.

Quotas that sound fantastic must be met—and exceeded.

Factory lights burn through the nights. Working hours are longer. Millions of new, inexperienced workers take their places at machines and benches.

As the pace grows faster and the days grow hotter, production experts, industrial physicians and safety engineers are making every effort to safeguard the physical fitness of American workers—to see that there's no seasonal summer lowering of production and efficiency—no increases in accidents and mistakes.

Interestingly enough, one of their most effective weapons against hot weather letdown is common salt.

The Cause and Cure of Heat Sickness

Until recently, one of the most baffling and serious causes of disability among employees has been heat sickness or heat cramps, particularly prevalent among workers engaged in hot, heavy work. In its milder forms, heat sickness is very often not recognized as such, showing up as a loss of energy, increased fatigue, or a general letdown in productive output. A situation extremely undesirable in war times.

Research has shown that loss of salt from the body, through excessive sweating, is at the bottom of the trouble. There is a very simple explanation for this fact. Every body cell, the blood stream, the spinal cord, the brain, must contain a certain amount of water if the proper chemical balance necessary for normal body functions is to be maintained. Unless salt is present in the proper quantities, the various parts of the body cannot hold the necessary amount of water. When body salt is lost through excessive sweating and not replaced promptly, cells and other parts of the body lose water, upsetting the delicate chemical balance of tissue and body fluid. If the salt loss is slight, the first reaction will be a tired, uncomfortable, letdown feeling. If this up-

set condition is allowed to continue, however, actual heat sickness and muscle cramps occur, which are quite capable of causing death in extreme cases.

Then, too, salt serves another important function by uniting with undesirable chemicals in the blood stream, transforming them to substances which can be thrown off through the bowels and kidneys, thus ridding the body of materials which might prove harmful if allowed to remain.

Look Out for the Mild Cases

Doctors and nurses know that the sure cure for severe heat cramps is an intravenous injection of brine containing a high percentage of salt. This is standard treatment for all hospital cases. The greatest hazard, however, is not the hospital case, but the thousands of less severe cases which go unnoticed, but which take their toll in production. Even a slight salt loss saps energy and slows up muscular coordination and reactions. When this happens, men feel tired and uncomfortable, mistakes increase, individual producing capacity goes down; and, as strength and efficiency are undermined, men become careless and serious accidents can easily happen.

To prevent these unnoticed, but highly dangerous cases, salt lost through sweating or other bodily functions should be replaced at the same time and in the same ratio as the loss. Unfortunately, our bodies do not store away extra salt for future use, but dispose of it almost immediately through the kidneys. So, if we are to keep our body salt up to standard, we must get a certain amount each day. The average person can obtain the necessary daily quota from the salt used in seasoning his food, but workers engaged in heavy work or long hours must have extra salt to compensate for the loss through sweating.

It is generally agreed by industrial physicians that the average worker needs, during the day, one level teaspoon of salt for each gallon of water he drinks. Since workers in even the hottest jobs rarely drink more than two gallons of water during an eight-hour day, the extra quota required is approximately two level teaspoons, approximately 60% more than the average diet contains. Men not on hot jobs will consume from two quarts to a gallon of water during the day and need half to a full teaspoon of salt, from 10 to 25%, more than the salt content of the average diet.

Workers Who Sweat Need Salt

Various methods are employed to supply salt to workers. Some plants add the proper percentage of salt to drinking water systems. This method, while entirely satisfactory, involves the installation of machinery and some attention to insure that the proper amount of salt is present in the water.

The use of salt tablets and tablet dispensing machines, placed near drinking fountains or on portable water coolers, has become increasingly popular. The tablets contain regular table salt, compressed under pressure to a uniform 10-grain size, which is approximately the size of an aspirin tablet. They are swallowed whole with a drink of water. No salt taste is noticeable and the tablets dissolve within 30 seconds after being swallowed.

Educational posters, placed on bulletin boards and near drinking fountains, are used to point out to workers the importance of replacing salt lost through sweating, and encourage them to take salt tablets, throughout the day, whenever they take a drink of water. Eight 10-grain tablets is the equivalent of one level teaspoon of salt, which means that workers engaged in light to medium work will require from 4 to 6 tablets daily; workers in medium heavy work from 8 to 10 tablets; and workers in extra heavy, hot work from 12 to 15 tablets during an 8-hour day. Salt tablets can also be obtained with 70% salt and 30% dextrose for extra energy.

In times like these when production is so necessary to the nation, the welfare of the worker, the maintenance of his ability to produce, should be conserved. Heat-fag should not be permitted to take its toll.

An avoirdupois ton of gold in cubic form would be a little more than one foot on each side and occupy 1.66 cubic feet.

+

The United States Government mints, by working around the clock, made more money in 1941 than ever before. The new record of domestic coins was 1,827,486,276 pieces, with a face value of \$102,209,510.45. In addition to the above they turned out 128,691,000 coins for Dutch East Indies, Curacao, Dominican Republic, Liberia and Surinam.

Hard Chromium Plating

BY AUSTIN FLETCHER

*Brewer-Titchener Corp.,
Binghamton, N. Y.*



Austin Fletcher

CHRONIUM is one of the hardest substances known. In Moh's scale, chromium is rated at 9 with the diamond at 10. The Brinell hardness of the electroplated coating is said to range between 500 and 900, depending upon the method of deposition. Its remarkable smoothness makes it especially suitable in certain applications where parts are in frictional contact, and which consequently benefit from prolonged life. Values on a comparative scale of static friction of surfaces are:

Babbitt on babbitt	100%
Steel on steel	55%
Steel on babbitt	44%
Steel on chrome plated steel	29%

This shows a reduction of 53% static friction.

Chromium is very resistant to corrosion, but is seriously attacked by hydrochloric acid, and to a lesser extent, by sulphuric acid. It is unaffected by any other acids, alkalis, the action of organic sulphur compounds, sulphur dioxide or hydrogen sulphide, except at extreme temperatures. Chromium resists oxidation to a temperature of 1150°F. and physical breakdown to 2500°F. Its melting point is 3326°F.

Many liquids, including water and even molten metals, do not readily wet a chromium surface. A somewhat similar effect may be observed when a chromium plated surface comes in contact with metals or other solids. For

This is one of the most comprehensive papers ever written on the applications of hard chromium plating. Most of the information given by the author is based on actual shop experience. Chromium plating of the following objects is discussed: Dies, gaging surfaces, machine and equipment parts, internal combustion engines, rolls, engravings, broaches, tinning apparatus, drawing dies, thread cutters, swaging dies, blanking and forming dies, and arc welding fixtures. The use of chromium plates for reclaiming of worn or undersized work is also discussed. A sequence of operations for plating is given.—Ed.

instance, chips literally fly away from a chromium plated rotary file and there is no loading of the teeth. A plated surface has very little tendency to seize, gall or cold weld to the surface of another metal when the two are rubbed together under pressure. This non-galling property is of especial value when dealing with the chip-bearing surface of a cutting tool and the wearing surface of a forming tool.

Chromium, while hard, is also very brittle and has poor tensile strength. Consequently, on applications where high surface pressures are encountered, the base metal must be hard enough to give the chromium good support, for if the base metal deforms, it will cause the chromium to break.

Dies

On several classes of dies, the use of chromium is widespread. Included are molding dies for forming plastics, such as bakelite or rubber, molds for forming glass articles and dies and mandrels used in drawing seamless tubing. Indeed, practically all non-ferrous seamless tubing now manufactured is drawn with chromium plated dies and mandrels, and many of the manufacturers of seamless steel tubing also have chromium plating installations for processing their own dies and mandrels. The advantages gained from chromium deposits in these applications are increased life of the tools, reduced tool maintenance expense, improved finish of the product, and, in the case of plastic dies, less sticking of the product to the die.

Gaging Surfaces

One of the oldest and best known industrial applications for chromium plate is the surfacing of gages. The proper technique in the tool room and plating room will so increase the life of gages that nowadays the chromium plated gage life is often limited only by the life of the gaging operation for which it is designed. The properties of chromium are such that three to five times as many holes are gaged with a chromium plated plug gage for an equivalent amount of wear than could be gaged with an unplated gage. Similar

results are obtained when using other types of gaging surfaces, such as ring gages and snap gages.

Machine and Equipment Parts

Under this classification, successful results from the application of chromium plating have been reported upon a very great variety of parts, ranging from tiny knitting needles to rolls weighing 15 tons or more. The chromium serves a number of different purposes, but primarily as protection against wear and against corrosion, particularly against corrosion by unusual conditions. In general, it is not considered that chromium plating directly upon steel has very good corrosion resistance, but for resisting the corrosion due to such things as hot vapors and gases, hot metals and certain highly corrosive chemicals, chromium has been uniquely successful. For instance, it was found that one of the few successful methods of combating the corrosion caused by impurities in hydrocarbon oil cracking operations was by protecting the surface of the chambers with chromium. Another application has been for the protection of dies used in zinc die casting operations. Another example is the use of chromium to protect paper making machinery against corrosion by sulphite liquors. Still another is the manufacture of chemicals which must not become contaminated with iron, where for other reasons, it is desirable to use iron or steel as a material of construction.

Under this same classification, the mention of the wearing qualities of chromium is most generally in connection with the various bearing surfaces. A great variety of parts in actual production are now being chromium plated as original machine equipment. Excellent examples are automotive pump shafts, valve stems, spring shackle bearings and king pins; in the airplane field, propellers, pistons, propeller shafts, governor parts, camshafts, connecting rods, etc. On non-automotive machinery, some manufacturers now provide as standard equipment, chromium plated lead and feed screws, drill spindles, reciprocating pump shafts, pneumatic tool cylinders and outboard motor cylinders, and non-machine parts such as expansion joints.

In the above applications, in general, the decrease in wear of the chromium plated parts is the desired result. However, in several places chromium gives other results which are very interesting. For instance, all pump shafts and reciprocating pumps in one of the large manufacturing companies in this country are being chromium plated, and the advantages reported are decreased packing wear, decrease in power necessary to operate the pumps, increased pump shaft life.

Reclaiming of Work by Plating

A very interesting use of chromium in machine shops is the reclaiming of parts that have been worn or accidentally machined undersized. There are very few methods by which metal, which has once been taken off a surface, can be replaced satisfactorily—where the amount of metal for resurfacing the articles with a surface that will wear at least as well and very likely much better than the original, and can be applied at a cost which is less than the cost of a new part. Such procedure is used regularly at the plants of bearing manufacturers, automobile manufacturers, machine tool manufactures and similar industries. Parts that have been reclaimed, range from small roller bearings to

large diesel engine crankshafts, and include such delicate work as multi-bearing camshafts and accurately made machine tool drive shafts.

Hard chromium is not easy to do and involves much detail. Its successful operation depends on a rather extensive knowledge of the electrochemistry involved, an intelligent analysis of conditions, and of prime importance is the chemical control of the electrolyte, close temperature and current density control, also, a knack for constructing ingenious and complicated racks and fixtures for holding the parts.

Some of the racks and fixtures run into a cost of \$2,000 for one job. This cost for one fixture is, of course, out of the ordinary, but Hendrik Van der Horst, formerly of Hilversum, Holland (now at Olean, N. Y.—Ed.) who specializes in plating large pistons and cylinders of diesel engines used in tractors, locomotives and marine vessels, claims it costs that much before they start to plate. He has plated cast iron motor ship engine liners, 5 to 12 ft. in length with bores ranging from 20 to 32 in. Some of the tanks he is using are 18 ft. deep. Demands at that time were that he plate main engine crankshafts. In these, 30 ft. are considered small. He believes he can do it. He also reports wear on piston rings reduced 75% with plated bore.

Other Uses for Hard Chromium

Some other successful applications are as follows:

2½-ton briquetting rolls. These are used mostly in the West where the soft coal is used. The chromium prevents corrosion and wear, and permits easy and quick release of the coal briquette.

5-ton cast iron rams for 1500-ton plastic molding presses. These rams are 36" dia., 56¼" long.

9-ton calendar roll 234" long, 18" dia. for use in paper mills. The use of chromium plating is quite extensive in the paper mills and the results obtained on some of the equipment are as follows:

	<i>Not Plated</i>	<i>Chromium Plated</i>
Embossing roll	3,000 reams	18,000 reams
Embossing roll	6,000 reams	12,000 reams
Printing roll	50,000 lb.	300,000 lb.
Evaporator—tubing . . .	11 months	42 months
Green plate	5 months	21 months

In the Printing Industry

Steel hand-engraved dies when chromed, make clearer impressions and will last three times as long. They can then be replated and restored to their original form. As an example, the plates used for postage stamps at the Bureau of Printing and Engraving are reported as giving twice the impressions from a case hardened steel plate, and about four times the impressions from a nickel surface. The chromed plates, however, are stripped and replated and thereby yield as much as ten times as many impressions as a plain steel plate.

Electrotypes and stereotypes produce from nine to fifteen times as many copies.

On oilcloth printing, a steel roll averages 800 tons of work produced against a production of 6800 tons with chromium plated rolls.

In the Textile Industry

Rolls which would produce 200,000 yards of cloth when unplated, produced 1,200,000 yards when plated, while also giving a better sheen and less defects, due to less pitting of the roll.

More Uses

A chrome plated line in the air chamber will increase the life from 100 to 200%.

In a paper presented at the International Conference of the American Electroplaters' Society in 1939, D. A. Cotton, Delco-Remy Div. of General Motors Corp., Anderson, Ind., reported: "following is a list of the outstanding types of work we are plating:

Broaches, burnishing tools, taps, reamers, spot facers, spinning tools, drill jigs, files, rolls, chuck heads, cams.

All types of molds.

Drawing—coining and header dies."

Mr. Cotton goes on to say: "With one man, we save around \$16,000 per year figured on a basis of salvage alone. This same man incidentally during this same time reset 800 diamonds."

In dip soldering and tinning, the pliers are chromium plated to prevent sticking.

Files used in filing machines on hard steels of the chromium-vanadium and similar types are chromium plated.

In combination blank and draw die for making ignition lock caps out of stainless steel, a steel die produced 1500 pieces. This die was plated with 0.0005" chromium and has produced 20,000 pieces and is still going.

Die cast automobile locks had to have 100% inspection. Test keys would not stand the gaff; steel keys would last 2 hours and chromium plated brass keys made 143,000 tests.

In making the projectors for horns, a coining die was used, which, when run in steel, would go from one minute to a week. This die was chromium plated and ran off 700,000 parts.

A plug gauge in steel made 9,970 checks. The chromium plated gauge made 48,924 checks and the wear was less than 0.0002". So much for Dr. Cotton.

Numerous replies have come from requests for information as to what is being done and the following are some of the outstanding ones.

Swedging die used for swedging three wires together and then used for making eye-glass frames. This die would run for about 4 hours, tops. Then it would necessitate taking down the set-up and polishing up the die; this die is now chromium plated and the minimum run is now 52 hours.

A tap running in Bakelite lasts for 1,000 holes; with steel, chromium plated, they get 3,000. It is then stripped and replated and is as good as new.

Molds in the glass making industry work exceptionally well on pyrex where a temperature of 2800° F. is obtained.

A spline quenching plug is used when hardening gears. This plug is about 3" long and 2½" wide with nubs sticking up. It is inserted into the gear while the gear is red hot, then immersed in oil until cool. The plug is then forced out under pressure. Plain steel plugs last for 25 pieces; when chromium plated, 4200 pieces.

Working Stainless Steels

Our own experience is as follows. Considerable work in our press room is done on stainless steel and we have for the past five years chromed all dies whenever we are working stainless steel. Two of the toughest jobs we have and which could not be done unless we have chromium plated dies are as follows:

When running 0.032" stainless 1" wide in a high speed press with a five station progressive die, we extrude into a ferrule which, when finished, is ½" diameter at the base with a 5/16" hole extruded to a depth of ¾". When this job was first tried with steel dies, the dies would pull out and would heat up. About 25 pieces would be obtained and the bunches would be shot. The latest count from this die with the original chromium plating, and with no die work being done over this period of five years, shows a production of 260,000 pieces.

A variety of stainless spool heads which are used for feeding wool, silk and rayon along the edge have to have a smooth edge. After these spools are blanked out, they are formed into a cup and then sharp edges from the blanking operation are turned up to a radius on a die and formed back on itself to within 3/16". Two hundred pieces would practically ruin a die before chromium plating them. Now, after a run of 11,000, the edges are still smooth.

One other outstanding performance is on a set of chasers for cutting threads. We take hot rolled bar stock and coin the end for a distance of 1½" then we cut a ¾-24 thread for the length of the coining operation. The best we could do was to secure a thread with the top of the thread broken off and very ragged, with a production of about 300 pieces between grinding of the dies. Now with the chromium plated chasers, we secure about 5,000 pieces and we have a perfect thread. This has now been increased to 3,000 pieces by changing the angle.

Here is an end mill which has been used at high speed in a Bridgeport head-on tool. Steel-cuts of 1/16" have been made and you will find it to be in good condition after two weeks' service in a tool room.

All production drills are plated. We have no wear on the side, no burning and no welding. When sharpening, all that is required is a slight cut on the edge and the drill is as good as new. We now estimate we get about 10 sharpenings on a chromed drill to one on a non-plated one. The non-plated drills usually were worn under-size and burned for about ½" from the end. This burned part had to be ground away.

We are using a rivet swedging die which on this particular part, we swedge down four points on the diameter of the 5/16" rivet to a depth of approximately 50 to 60 thousandths. For this purpose, we are using a ball shape swedging die which has two 3/32" slots cut at right angles to each other. The plain steel punch run was 3,000 pieces. When chromed, they run 24,000 pieces. On this same piece, we are reaming two 0.998-0.999" holes in line. The amount of metal removed is about 1/32". This amount of metal which is excessive for reaming, has to be left because the parts when formed do not bring the holes in line. This causes considerable side strain, due to the reamer cutting more on one side than it does on the other, to bring the holes in line. This part is made of soft 1010 steel

which has a tendency to also load the reamer, causing the holes to be oversize and ragged. These reamers as purchased would run 5,000 pieces, and then the reamer became undersized and was discarded. After discovering what could be done with chromium, we recovered these discarded reamers and are now producing a hole up to size and the production runs are 7,500 pieces with each coating. As soon as they get near the low limits, we strip and replate. These reamers will run indefinitely. Also these plated reamers do not load up and thus do not score the hole.

Despite the chromium plating, we still get a burr on the hole. To remove this, we use a 1-3/16" counterbore mounted on a pilot. Plain steel runs 2,000 pieces; chromium plated bores run 4,000 pieces.

Then we have a clinching die for assembling a 5/16-18 nut into a retainer. This die caused considerable trouble from the prongs cutting into the curling radius on the die which made them upset and deform and produce scrap. Before chromium, maximum production was 5,000 pieces. After chromium plating, production jumped to 100,000 pieces.

We pierce a hole 0.140" dia. which is then extruded to 0.328". On this job we used various steels hardened to perfection and highly polished, and the best we could do was a very short run before punches loaded up, started to score the hole and drag down a long burr. At the present time for this punch, we are using a commercial drill rod, machining proper end and chromium plating. While no actual production figures are available, the increase in production is considerable and the quality of the hole much better.

Life of Broaches Improved

We are broaching the teeth on a brake lever sector which engages the pawl on the brake lever proper. The material is 1020-1025 steel which makes it more difficult to cut than the average hot rolled steel. In chromium plating this broach, we have materially increased the number of pieces per grind; also the chromium decreases the amount of chip loading.

It is characteristic of steel tools, such as burnishing bars and burnishing broaches which are forced, often under high pressure, against a metal surface which must be displaced without being cut, to become scored and so rendered useless. Chromium has the property of resisting this scoring when in contact with metals. A chromium surfaced tool slides freely over the metal to be burnished and produces a finer finish more rapidly and without galling.

We have another good example of what a burnishing broach can do to these tubes, 0.049" wall seamless steel tubing 9.265" long: Broached to 2 sizes from 0.887" to 0.893" for 7 1/4" long and from 0.893" to 0.910" for 1 3/4" long. There is no metal removed; it is just expanded. The average life of a plain steel broach on this job can be and is at some time about five minutes, depending upon the quality of the steel in the tube. The third piece usually shows scoring. It will do on a fairly decent grade steel about 200 pieces, but then the broach is undersize. The average life for all grades of steel with a chromium plated broach is 4,500 pieces per chromium plate.

On a 5/16" cored hole in a casting which has a carbon content of 3.6% and silica content of 2.4%, we drill a 15/32" hole and mill a 3/16" area around the hole at the

same time. This is a combination drill and milling cutter. From this operation we go to a combination reamer, counterbore and milling cutter which reams the hole to 0.480" with a 0.062" counterbore and face mill the 3/16" area. Then we tap the 0.480" hole with a 9/16-12 tap. The difficulty encountered on this high carbon casting is build-up on the tools, especially the 0.480" reamer end and the taps. After running 75 pieces, we had both an oversized reamed hole and tapping. After chromium plating, no difficulty was experienced on the reaming, and this tap which was taken off the operation in production, has run 5,375 pieces.

Blanking and Forming Dies

Stamping is made of 0.093" stock. The first operation is a combination blank and draw die. Blank size is 4 3/4" and drawn to a depth of 1 3/4" x 2 7/8" wide. The second row goes to a depth of about 2" and about 2" wide. The third draw is 2 1/8" deep and 1.780" wide and the final coining for size is approximately 1.65" wide. The production before and after plating is as follows:

<i>Before Plating</i>	<i>After Plating</i>
Combination blank and first draw—600 to 700 per hour	2,000 per hour
2nd and 3rd draw—300 per hour	7,000 "

Plating Arc Welding Fixtures

Arc welding fixtures, as you men with experience along these lines well know, take an awful beating and they must be constantly cleaned, the spelter must be constantly removed by chipping and scraping, and at best the life is very short.

While chromium plating does not cure all the evils, the spelter that does adhere, cleans off more readily and consequently increases the life of the fixture from 2 to 3 times and, of course, will speed up production.

There is another interesting application for chromium plating, namely, that of gages made from cold rolled steel.

Practically all gages are made from tool steel and tool steel is scarce at the present time. It has been found that ordinary 1010 cold rolled steel can be case hardened to a depth of .020" or more and then chromium plated. It has been found that this type of gage will last indefinitely. A considerable number of gages have been made in this way, and in some cases, we have made simple dies from cold rolled steel which were then case hardened and chromium plated with excellent service being obtained.

The Steps in Chromium Plating Dies

1. Rack properly, that is, so the die is firmly held.
2. Clean thoroughly in cleaner solution.
3. Rinse in cold water.
4. Acid dip, until rust or scale is off.
5. Rinse in cold water.
6. Brush with pumice stone so that when rinsed in cold water, there are no water breaks.
7. Rinse thoroughly.
8. Let stand in hot water until die becomes hot.
9. Re-rinse in chromium solution for one minute.
10. Plate in chromium solution, starting with enough amperage so that the solution will work. Gradually work to desired amperage. Plate dies at 4 amp./ft.²
11. After plating, rinse in hot water thoroughly.
12. Heat treat in oven at 300° F. for 1 to 2 hours.

Flexible Molds

By SAMUEL WEIN

New York, N. Y.

THE common or accepted expression "mold" at once gives the impression of a form into which a viscous or plastic mass may be forced under pressure against its walls. Such molds must be sufficiently rigid to withstand high pressure. These molds are usually made of the finest grades of tool steel. They take time to make, and the highest form of skill in working is necessary to form them. As a consequence, thereof, these types of molds may be considered to be comparatively expensive.

In the industrial arts, the occasion arises very often where a "short run" in plastic castings must be had, and where the investment for its production and the time involved is very limited. To fill such a need, the use of "flexible molds" may be resorted to. These "flexible molds" may be made of rubber latex or synthetic rubber compounds.

Before studying the methods of forming these flexible molds, it is fitting that we review the advantages of their use in order that we may fully appreciate their value as a means for casting plastic compounds.

The advantages are as follows:

1. A decided advantage these types of molds have over the metal equivalent is the fact that they are inexpensive and that one can be made within a comparatively short space of time.

2. A short run, sometimes can have as many as 250 castings made in one mold. Such a convenience permits the manufacturer of a given product to make a casting and to demonstrate to his prospective customer the finished product. If changes are necessary, they may be made in a comparatively short time with a small outlay for labor and materials.

3. The chief advantage flexible molds have over rigid (metal) types is the fact that a plastic casting can be made in them having accentuated undercuts, with the most minute details.

4. Another advantage is the fact that a model in wood, plaster of Paris, or other material will serve as a good model form or base.

Steps in the Process

The steps in the successive order in which the mold is made are:

1. A model or pattern is first formed in wood or plaster of Paris. The dry and cleaned pattern is then placed on a flat glass plate or shellacked wooden board.

2. A film of the viscous rubber or rubber-like compound is deposited on the model and allowed to dry and congeal. If one film is too thin, the process is repeated until a sufficiently thick or self-supporting flexible film is formed on the model.

3. The outer surface of the flexible mold is then lacquered. This serves as a means of effecting ease of separation between the mold and the plaster shell.

4. To further increase the rigidity of the rubber mold and permit easy handling, a plaster of Paris backing or outer coating is applied to the mold. This, of course, is split to permit access to the mold, and usually doweled to assure an accurate fit.

5. The inner walls of the flexible molds are treated with a separating medium to prevent possible adhesion between the plastic casting and the mold itself.

6. When this is done, the mold is ready for casting and allowed to congeal (harden), either by (a) increase in temperature, (b) by the addition of an accelerator, or (c) by the simultaneous action of heat and the accelerator. When this congealing period has expired, the casting is removed from the mold by flexing or pulling out, just as one does in the case of a rubber glove on the hand.

From the foregoing, we have a good idea as to the necessary steps essential in the production of a flexible mold, accordingly, we shall now discuss the formation of the mold and the method of making the same.

The Model

The model from which the flexible mold is to be made, may be made in such materials as (a) wood, (b) metal, (c) plaster of Paris, (d) and, in fact in plastics, itself.

In order to make a proper mold from the original, it is necessary that the model be dry and clean, that is, free



Fig. 1. On left is a rubber mold and on right is a plastic casting of President Roosevelt. (Courtesy Modern Plastics Magazine).

from finger marks, oil, grease, dust, etc., as these interfere with the proper deposition of the rubber film on the model. Furthermore, all pin-holes and surface abrasions should be filled in; otherwise these will be reproduced in the mold and subsequently in the plastic casting.

The Rubber Latex Compound

The flexible molds coming within the scope of this heading are usually made of an aqueous and dilute solution of rubber latex. A list of firms is available for the readers who might desire to secure the compound for experimentation, etc.

Forming the "Facer Film"

The model or pattern is placed on a flat glass plate or a well-shellacked wooden board. The rubber compound used to first deposit the primary film is a dilute solution of rubber latex. The reason for using a dilute solution is to form an extremely thin film of rubber on the model or pattern, and thus get intimate contact between the rubber and the model.

The primary or facer film as well as the subsequent films may be formed in any of the following convenient methods:

1. *Dipping.* Here the model or pattern is dipped in the rubber latex compound for several minutes, taken out and allowed to dry. This process is repeated until the proper thickness has been reached.

2. *Brushing.* The rubber compound may be applied to the model by means of a soft hair brush such as a camel's hair or badger.

3. *Spraying.* The most convenient and successful method is the use of an air gun or spray. This latter method produces a more homogenous film throughout the model or pattern surface.

Film Thickness

There is no fixed rule that can be given as to the number of latex applications, since this factor depends entirely on the percentage of rubber in solution (viscosity), and this factor varies with each manufacturer. Another factor to be considered is the manner in which the film is applied. However, experience has taught us to apply between three and six layers or films on top of each other, at which time there has been reached a sufficiently thick film of rubber.

Once a film of latex has been applied to the surface of the model, approximately twenty minutes to an hour should be allowed between coatings for thorough drying of the film formed.

If it is desired to accelerate the drying (curing) of the rubber film, it may be placed in an oven with circulating air, at a temperature not exceeding 175° F.

Re-enforcing the Film

From a practical viewpoint, it is found that the "primer or facer" film of rubber so formed is usually too thin for supporting itself. Therefore, it is found necessary to re-enforce the film, and rubber latex compounds are used



Fig. 2. Original plastic cast on left, rubber mold (center). The plastic compound is poured from the bottom until filled level with bottom of the mold. Plastic casting (right) after removal from rubber mold. (Courtesy Modern Plastics Magazine).

to accomplish this end. The difference in the two solutions, i.e.; facer and re-enforcer, is usually the difference in viscosity, or more rubber latex in solution.

The compound made for this re-enforcing purpose by the Heveatex Corporation, comes in two separate containers, and is termed by them as "A" and "B".

Compound "B" comes in the form of a dry powder. If this powder has lumped, pass it through a screen to break it up, and mix this fine mass with two parts by weight of compound "A". Mix thoroughly, producing a compound of fairly high viscosity, and on standing, the viscosity or stiffness of the mixture tends to increase. There is between 1½ to 2 hours working time before this compound gets too heavy, or too stiff to handle. Apply the paste so formed to the rubber film first formed, using in this latter case a spatula or any other convenient tool.

In view of the fact that the two materials are set up within a certain length of time after mixing them together, it is only desirable to mix enough to actually do the work in hand in each case, or not more than can be applied within about an hour's time.

Concerning Pin Holes

If the rubber latex is properly applied to the model or pattern we will be rewarded with a continuous film of rubber, but if the temperature is a bit too high, the rubber will decompose and produce pin-holes. Another factor leading to pin-holes is air bubbles formed during the coating operation. Pin-holes will be reproduced in the plastic castings made therein, and at times interfere with the proper separation between the casting and the rubber mold.

Varnishing

This step is a very simple one, and consists of varnishing the outer rubber film formed with one or two coats of ordinary shellac solution. The purpose is to further effect separation between the rubber film so formed and the next successive step.

Plaster Re-enforcing

The well-shellacked rubber mold is now backed up with at least an inch of plaster of Paris solution and allowed to dry. The purpose of the latter is to give this rubber mold mechanical rigidity, for without it, after the plastic mass has been poured into it, the rubber mold will positively bulge in spots and get out of shape, because of the weight of the plastic in the mold.

In the case of a large piece, it is well that the plaster shell, as it is sometimes called, be made up in two or more sections, and held together with pieces of cord at the time of pouring the plastic mass into the rubber mold, preventing thus, the displacement of the rubber mold.

Where an undercut is dealt with in a rubber mold, the plaster shell should be formed at that point, in order to make it possible to remove it at the one point, also, this shell should be separate from the other plaster shells formed. In other words, we have a number of plaster shells held together by means of a string, giving the rubber mold much mechanical rigidity, a most necessary convenience.

Korogel

Korogel is a rubber substitute, synthetically prepared. It has many superior properties and lends itself better in many respects as a molding compound.

In order to use Korogel as a molding compound, it must first be melted in any of the following methods. Until one becomes accustomed to the appearance and behavior of the compound at different temperatures, we recommend (in all the methods to be outlined) the use of a thermometer to insure that the material will not be heated above 310° F.

In all of the methods, the melting is expedited by starting with a very small quantity of the solid Korogel. When this has melted add another small quantity; continue in this manner until the required quantity is melted. When relatively large quantities are to be melted, the weight of solid material added to the melt each time, may be successively increased.

Small batches may be melted in an enamelled or glass container on an asbestos mat over a slow gas flame. The Korogel should be stirred continuously to prevent burning on the bottom of the vessel.

Another method for melting which has been employed successively on larger batches involves the use of a double boiler, using oil as the heat transfer medium. The inner vessel must be enamelled; the outer vessel (oil container) may be of any rigid metal. The oil used should have a high flash point, such as steam engine oil, that will not smoke at temperatures above 500° F. This arrangement insures more uniform heating over the surface of the Korogel container. It is necessary to stir slowly during the melting.

Still another method of melting involves the use of an electric heater, especially designed for Korogel by the Staw-Warm Electric Company of Ravenna, Ohio. These heaters are available in several sizes and may be obtained with either fixed or variable thermostatic control. For rapid work, the variable control is recommended, using a higher initial temperature and setting the control back to the required point until the melted material is needed.

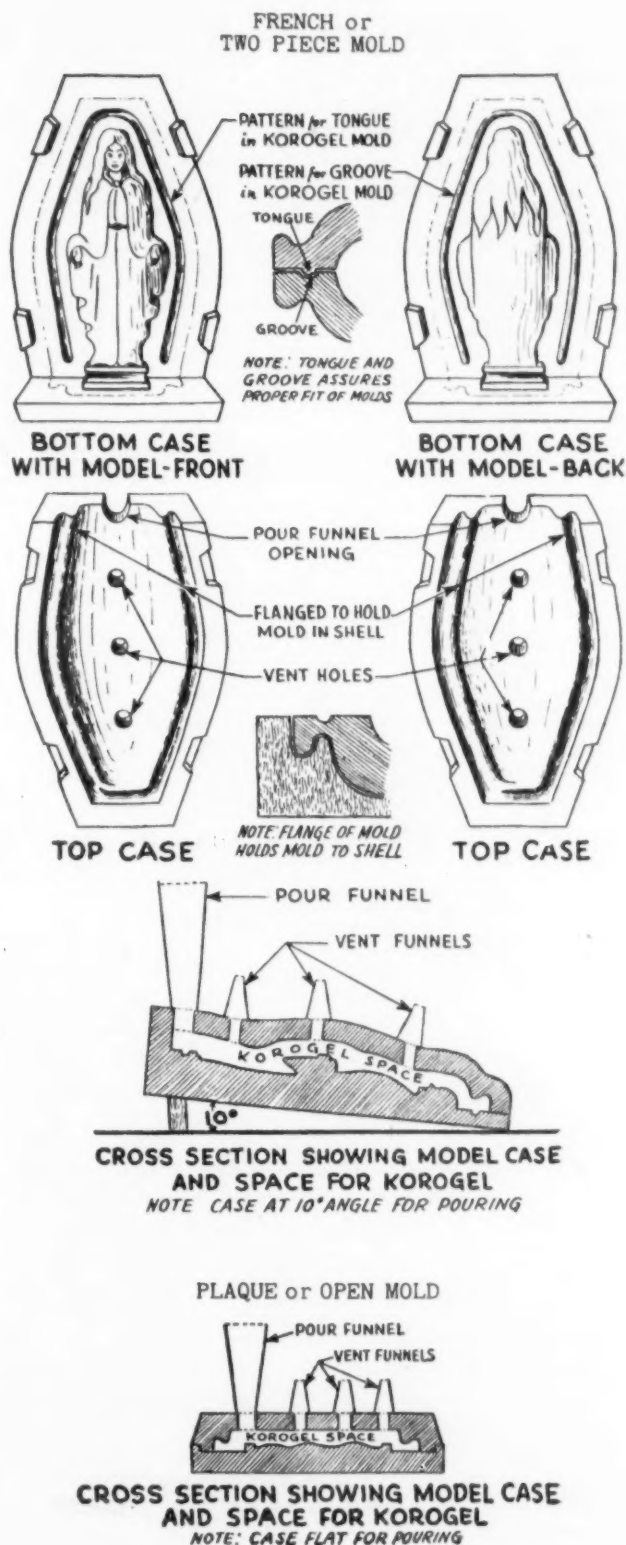


Fig. 3.

Drawings illustrate typical construction of two-piece molds for casting Korogel. Proper techniques for pouring and venting of both flat and irregularly shaped molds are shown.

Pouring

After the Korogel has been melted, it should be allowed to stand without heating or stirring so that the air bubbles (which have been stirred into the melt) may rise to the surface. These bubbles may then be broken by flashing a blow torch or gas burner across the surface. If the bubbles are not removed from the melted material, they will form small holes in the mold after it has set. Having removed the air from the melt, the temperature should be allowed to drop to the point where the Korogel will just flow. (A temperature of approximately 290° F. is recommended, but this can best be judged by the individual operator). These last statements are made on the assumption that a plaster or other kind of model or pattern is to be used. If a metal model is used, it is not necessary to cool the melt before pouring. (It is still necessary, however, to remove the air from the melt as above described.)

Arrange the model in the ordinary manner, with the pouring funnel at the high end, and with all high points of the mold fully vented as indicated in Figures 1 and 2. Pour the Korogel very slowly into the mold.

Treatment of the Model

Since Korogel is poured at a high temperature, it is desirable to choose, if possible, a model made from a material which will withstand the increased temperature. When the choice of a material for the model is impossible, it is necessary to treat the available model in such a way as to adapt it to Korogel.

To ensure separation of the model from the cast Korogel, the surface of the model may be treated with a suitable separating medium.

The Separating Medium

Latex and Korogel when applied to a model or pattern will give rise to adherence, this is especially true in the case of the plastic casting in the mold. In both i.e.; the formation of the mold in the case of the Korogel, and the casting of the plastic compound in the flexible molds, the surface must be treated with a suitable "separating medium". These are usually greasy or fatty compounds, and the following have been tried and recommended by the various workers:—(1) vaseline, (2) glycerine, (3) stearic acid solutions, (4) castor oil, and (5) fats.

The Casting Compounds

The casting compounds that have met with the best success from a practical view point are the phenolic types, and these can be had from the several firms names of which are available from METAL FINISHING.

These casting compounds (plastic) may be set or congealed in the molds by (1) a suitable "accelerator" (2) heat or, (3) by the simultaneous action of heat and the accelerator.

The resinous plastic compounds are had in a sticky viscous liquid, and this may be poured out of the container by placing it in a water bath. In order to avoid discoloration of the mass, it must not come in contact with metals other than lead. Glass, nickel or stainless steel are excellent, if available.

Casting with Catabond No. 200 CZ-200

To 3 parts of concentrated hydrochloric acid add 1 part of water, or 3 parts concentrated hydrochloric acid and 1 part of alcohol should be added to this resin. The amounts used to hasten or "accelerate" the setting or coagulation will vary somewhat according to the particular requirements of the job.

A recommended procedure is to use about 8 parts by weight of accelerator No. 1 to 100 parts by weight of Catabond No. 200 CZ. The accelerator and the resin should be very thoroughly mixed and then poured into the mold. If it is desired to remove the air bubbles before casting, it can be done by applying a vacuum to the resin.

The resin should be cold when cast into the molds, but it may be pre-heated before casting. It is also advisable to wet the surfaces of the mold immediately before casting by rinsing with a mixture of 9 parts alcohol and 1 part of castor oil or glycerine.

Using Catabond No. 700

2.25 cc. of accelerator No. 5 per ounce of Catabond No. 700 resin (or 10.5 parts of accelerator to 100 parts of resin) will be found satisfactory. In no case should more than 2.50 cc. per ounce (or 11.55 parts) be used in casting the resin. Should there be a dark blue discoloration when the accelerator is first added to the resin, it later disappears upon hardening of the resin.

If an accelerator hardening is desired, the mold after casting may be placed in an oven, at a temperature not exceeding 175° F. for about one hour. Slower settings can be obtained by decreasing the amount of accelerator.

Heat Setting

The resin will be cured in the molds at 80° C. between 48 to 72 hours. Under-curing will make the casting brittle, and further curing will make the material hard and tough.

Monsanto No. R-4010 Resin

To 100 parts by weight of this resin add 8 parts of accelerator No. 2. Stir thoroughly to mix the resin and accelerator.

This compound will harden in about an hour at 160° F. if transparent castings are sought. Further heat treatment will give rise to a compound that is cloudy and translucent.

Pigments and dyes may be added to the liquid resin, preferably those which are not affected by the acid condition of the resin, as well as the accelerator used.

A Comparative Study of Oils for Supplemental Protection of Black Oxide Coatings on Steel¹

EDWARD A. PARKER² and A. KENNETH GRAHAM³

OIL films are extensively employed over phosphatic and oxide coatings on steel for supplemental protection. In such applications the protective value of the coating is of a relatively low order compared to that afforded by the oil film. Furthermore, the protective value of the coating plus oil film exceeds in magnitude the sum of the protection obtained by the coating and oil film when applied individually to the same steel. However, since the oil films are largely controlling, the primary object of this study was to obtain comparative salt spray data on the protective value of various oils, using steel panels uniformly coated with black oxide.

One lot of cold rolled SAE 1010 steel was used throughout this study. Panels 2" x 4" were thoroughly cleaned and then treated for 15 minutes in each of two "Jetal" baths operated at 290°F and 310°F. After thorough rinsing, the panels were dried and then coated with the oils to be tested. A set of 4 or more panels were used with each oil and the salt spray evaluation was then obtained in the manner described in a previous paper⁴.

Different type oils were obtained from a number of commercial sources as follows:

1. Straight mineral oil with and without added compounds or inhibitors.
2. Fatty acid type oils.
3. Antirust compounds of the standard solvent type.
4. Water soluble oils.

A partial list of the oils tested is given in Table I. The soluble oils were employed as water emulsions at 180°F. using 50% oil by volume in the mixtures. The other oils were applied at room temperature without any dilution or modification as to composition. In all cases the oxide coated panels were immersed in the oil and immediately mounted in a

vertical position in racks and allowed to both drain and reach equilibrium for twenty-four hours, or at least overnight. The racks were then placed in the salt spray chamber without touching or otherwise disturbing the oil films and tested.

In evaluating the samples⁴, a rating (4) represents the salt spray hours for the first appearance of rust. A rating of (3) represents slight rust, i.e. a few small spots. If four duplicate panels were used, eight faces were evaluated and the results averaged. In all cases these panels were

distributed throughout the salt spray chamber to eliminate the effect of possible variations from the source.

Referring to Table I it should be noted that the 100 viscosity mineral oil A failed badly. The B and C inhibited and compounded oils give improved protection of 5 and 10 hours respectively for the first appearance of rust. Sperm oil D which is commonly recommended for oiling black oxide coated steel ordnance parts gave 13.5 and 26 hours for ratings of (4) and (3) respectively.

The solvent type antirust compounds

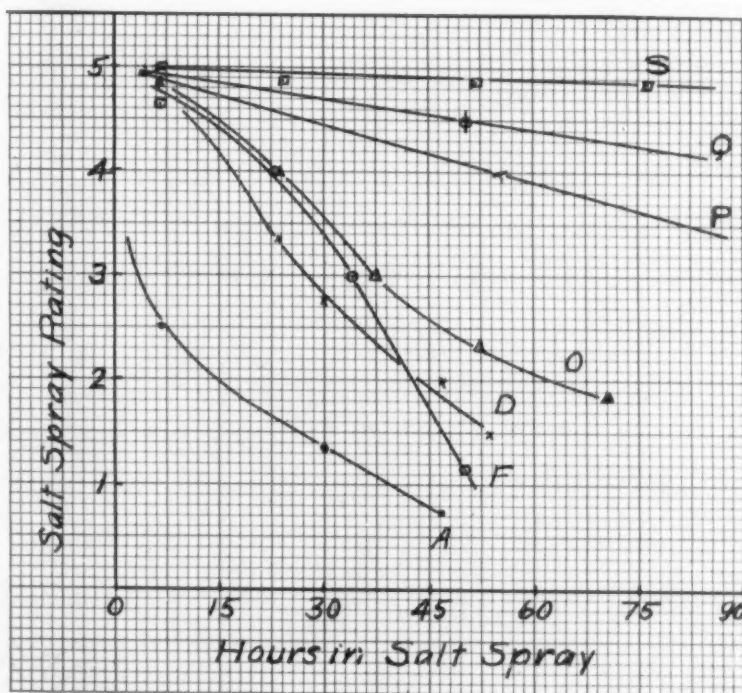


Figure 1

Comparison of salt spray evaluation of various type oils over black oxide coated steel. Ratings vs. hours in salt spray.

- 5 = perfect.
- 4 = first appearance of rust.
- 3 = slight rust.
- Curves O, P, Q, S are soluble oils.
- Curve A is mineral oil.
- Curve D is sperm oil.
- Curve F is solvent type antirust.

TABLE I
Comparative Salt Spray¹ Evaluation of Oils Over Black Oxide Coated Steel

Oil	Type Oil	Hours for Rust to Appear Rating ² (4)	Hours for Slight Rust Rating ² (3)
A	Mineral—100 viscosity, 100°F	..	2
B	A + inhibitor	5	9.5
C	A + compound	10	23
D	Fatty acid—Sperm	13.5	26
E	Solvent—resin base	32.5	42.5
F	Solvent—40% base	23	34
G	Solvent—35% base	20.5	32
H	Solvent—20% base	13.5	22.5
I	Solvent—30% base	10	23
J	Solvent—60% base	10	23
K	Solvent	22	31.5
L	Solvent	10	21
M	Solvent	7	18
N	Solvent	16.5	25
O ³	Soluble—50% water mix	23.5	37.5
P	Soluble—50% water mix	55	97.5
Q	Soluble—50% water mix	98	175
R	Soluble—50% water mix	150	150
S ³	Soluble—50% water mix	300	300

Note 1—Army, Navy, Aeronautical Specification AN-QQ-S-91.

2—Ratings as described in *Metal Finishing*, May p. 254, (1942).

3—Oils O and S are known as "Jetoils" No. 1 and No. 2 respectively.

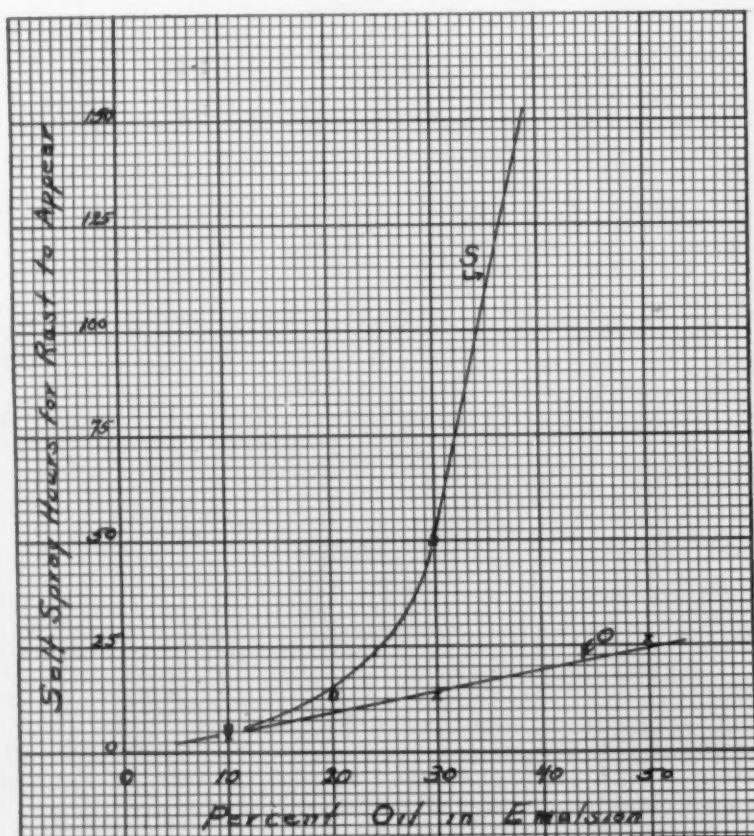


Figure 2

Effect of concentration of soluble oil in emulsions on the salt spray resistance of black oxide coated steel.

Per cent Oil vs. Salt Spray Hours for rust to appear.
Soluble Oils—"S" and "O".

varied widely in their protective value. The best oil E gave 32.5 hours for a rating of (4), but the heavy film produced would not be acceptable for many applications. Oils F and K gave more satisfactory films and were the best of the solvent type tested. In general the protection offered by these oils was better than that obtained with either sperm oil D or the 100 viscosity mineral base oils, A, B, and C.

The soluble oils also varied widely in their protective value but were found to be superior to other types in this comparative study. Oils O to S inclusive were employed as 50% water mixtures at 180°F. They represent the best of those tested, giving 23.5 to over 300 hours for a rating of (4). Their superiority as compared to mineral oil A, sperm oil D and the solvent oil F is more clearly shown by the curves of salt spray ratings against salt spray hours in Figure 1. Oils O, P, Q, and S are quite superior to A, D, and F.

Aside from the excellent protective value obtainable with certain soluble oils other advantages may be obtained by their use which warrant serious consideration. The film produced may be widely varied by varying the proportion of oils and water used in the emulsion, realizing of course that the more dilute emulsions give thinner films and less protection. There is no fire hazard associated with their use. Work may be taken directly from the last water rinse into the hot emulsion and dried in air while draining. It is also possible to apply the hot emulsion by spraying, using pressure rather than air sprays. Any loss or dragout is less costly because of the large percentage of water contained in the mixtures. Of the oils employed as supplemental films over black oxide coatings on steel, the soluble oils generally cost less than other types offering equal and in many cases less protective value.

In choosing an oil for supplemental protection, two factors are of greatest importance, namely, the nature of the film and the degree of protection required. The character of the films may be varied through the use of the various types of oils. The films may be heavy or light and oily. In some cases the films may be greasy and in

(Concluded on page 367)

Because of the interest in shop problems, we are publishing herewith many more problems than ordinarily published. Unless otherwise noted, the answers are those of the editor, Dr. Walter R. Meyer. If any reader can answer any questions unanswered, or can suggest better answers, they will be gratefully received.

Pickling Chrome-Moly Steel

Kansas City, Kan.

"Gentlemen:

We are sending you under separate cover a small piece of chrome-moly tubing. Will you give us your advice regarding the method of cleaning this part in order that it may be silver soldered."

G. M. G.

Dear Sir:

We have checked the sample chrome-moly tubing sent us which was to be pickled previous to welding.

I believe the best method of pickling would be to first clean the welded tubing in one of the usual alkaline cleaners and following this, remove the scale in a 1 to 1 solution by volume of hydrochloric acid and water, to which an inhibitor has been added. The use of inhibited acid is necessary because attack upon the tubing itself results in the liberation of a considerable quantity of smut, and this attack can be prevented by the use of an inhibitor in the acid.

In case smut is formed upon the work, this can be removed by making the work anodic at 6 volts in a strong solution of caustic soda—a concentration of 2 lb. per gal., operated either cold or warm.

Finishing Jewelry Rings

Bronx, N. Y.

"Gentlemen:

In finishing jewelry rings, are the rings first enameled and then plated or first plated and then enameled? What is the procedure for applying the enamel?"

S. L.

Dear Sir:

Normally it is advisable to first apply the enamel and then plate to obtain the desired color.

If hard enamel is used, it is applied and fired, and then polished. If plating from a gold solution is to be performed, run the solution warm rather than hot, and also use a low current, not over 2 amp. per sq. ft. For work of small area, a low range ammeter is advisable rather than depending upon a voltmeter. With a low, known current, the plating time can then be adjusted to obtain the thickness of deposit required for the type of work being handled. Gilding can be

done on this type of work from a salt water plating unit.

If a transparent enamel is being used, the article should first be silver plated to give a white background, then enamel and proceed as above.—G. B. H., Jr.

Literature on Hard Chromium Plating

St. Louis, Mo.

"Gentlemen:

We are looking for a book on hard chromium plating and will you let us know whether a book of this kind has ever been published?"

H. H.

Dear Sir:

To our knowledge there has been no book published in English devoted exclusively to the subject of hard chromium plating. There was a book published in German, entitled, "Die Hartverchromung" but, unfortunately, this book is not available, and of course, could not be understood by anyone not reading German.

Hard chromium plating is discussed extensively in the 1942 "Plating & Finishing Guidebook." The following articles have also been published in past issues of METAL FINISHING on hard chromium plating:

"Industrial Chromium Plating", by A. Man-
kovich, June 1941, pp. 294-96.

"Hard Plating of Plastic Molds", by A. W.
Logozzo, November 1940, pp. 579-83.

"Application of Hard Chromium Plating",
by R. Goodsell, September 1939, pp.
415-19.

Permission for Reprinting

Philadelphia, Pa.

Dear Dr. Meyer:

On page 276 of your May issue of the "Organic Finishing" section of METAL FINISHING you have prepared copy for a suggested sign that might be erected in finishing departments.

We think so much of this copy that we would like your approval to our use of your copy on signs which we would prepare, produce and distribute among our customers.

Providing there are no objections to our production of such signs, would you be so kind as to notify us of your approval. We shall be glad to submit a finished copy of our sign to you.

D. P. Co.

Permission was granted.

Heavy Iron Plating

Grand Prairie, Texas

"Gentlemen:

Will you please send me a good iron solution. I need a fast depositing solution for building up parts that are undersize."

C. A. W.

Dear Sir:

The usual solution for building up heavy deposits of iron is one composed of ferrous chloride 50 oz. per gal. and calcium chloride 25 oz. per gal. This bath is used hot, namely at 185° F. or higher, and current densities from 40 to 70 amperes per sq. ft. are used, although much higher current densities may be used under special conditions. Acidity is maintained by the addition of hydrochloric acid. Ferric iron must be kept low by frequent additions of iron or iron powder to reduce the ferric iron.

A bath composed of ferrous chloride 32 oz. per gal. and potassium chloride 24 oz. per gal. has been proposed by Thomas and Lamb. The concentrations may be varied widely and iron may be deposited from this solution at room temperature. The deposits obtained at room temperature are brittle, but the ductility increases with a rise in temperature. This bath is particularly useful when deposition is to be done upon wax electrotypes, and in this case, the upper limit of temperature is 95° F. Current densities up to 50 amperes per sq. ft. can be used at 95° F. The pH is maintained between 5.0 and 5.5 by periodic additions of potassium hydroxide solution.

Articles on Principles of Electroplating

Milwaukee, Wis.

"Gentlemen:

I enjoyed the booklet on 'Principles of Science Pertaining to Electroplating' written by N. Promisel, and I am writing to ask whether he is going to continue the balance of the articles in future issues of METAL FINISHING."

C. F. H.

Dear Sir:

We had hoped to publish another article in Mr. Promisel's series of articles, in the June issue of METAL FINISHING but, unfortunately, Mr. Promisel has not had an opportunity to prepare the same. He has been so busy with his work for the Bureau of Aeronautics, Navy Dept., Washington, D. C., that he has had to forego the matter of writing the articles for several months.

We hope to have the articles continued but they will be relatively infrequent. The demand has been great for the booklet mentioned above, and the interest has been decidedly gratifying.

Megapyr Wire

Prince Bay, N. Y.

"Gentlemen:

I am writing to inquire about the 'Megapyr' wire which you mention in your publication 'The 1941 Casting Manual of Non Ferrous Metals.' You refer to it in part II entitled 'Technique' in the chapter under 'Furnaces'.

I would appreciate it very much if you could send me the physical characteristics of the wire. Better yet would be the name and address of the manufacturer or any other available information which you have."

S. S. W. D. Mfg. Co.

Dear Sir:

Megapyr wire refers to wire of the following composition.

Chromium	30%
Iron	65%
Aluminum	5%

The term "Megapyr" is a German term and naturally wire would not be available under this name at the present time.

Tantalum Plating

Naugatuck, Conn.

"Gentlemen:

Is there any information you can give me concerning tantalum plating, or can you direct me to the source from which such information can be secured?"

B. Co.

Dear Sir:

We do not believe that tantalum has ever been electrodeposited from aqueous solutions, although it is possible that it has been, or can be, deposited from fused salts. Dr. Wm. Blum in his article entitled, "What Metals can be Electrodeposited from Aqueous Solutions", and which was published in the December 1940 issue of The Monthly Review, stated that it is doubtful whether tantalum can be plated from aqueous solutions.

Blistering of Silver Plate on Heating

New York, N. Y.

"Gentlemen:

We have experienced a troublesome phenomenon, namely, the blistering of silver plate, when the plated object is heated to temperatures of the order of 600°F. Will you let us know whether this trouble is due to defective plating."

A. B. Co.

Dear Sir:

The phenomenon described by you is rather unique. Silver has a relatively high permeability to oxygen at higher temperatures and it is believed that when silver plated objects are heated, oxygen diffuses through the silver to form an oxide on the base metal or creates a pressure sufficiently great to cause the silver to exfoliate. Naturally, the degree of exfoliation depends upon the length of time exposed to the high temperature, the degree of temperature and the thickness of silver coating. If the objects are to be given a heat treatment after silver plating, it is recommended

that this be done in a neutral or reducing atmosphere.

Dropping Tests for Cadmium Plating

Linden, N. J.

"Gentlemen:

Could you please answer for me the following questions: How to make up an ammonium nitrate solution to test the thickness of cadmium plate on brass, and on steel? How to make up a solution to test a nickel plate thickness on brass and on steel?"

L. M.

Dear Sir:

The ammonium nitrate solution has been replaced generally by the chromic-sulphuric acid dropping solution, which gives better endpoints than the ammonium nitrate solution.

The chromic acid solution is made by dissolving 200 grams of chromic acid and 50 grams of sulphuric acid in 1 liter of water.

The amount of zinc or cadmium plate removed depends upon temperature and the amount of metal removed per unit of time increases with an increase in temperature. The effects of temperature and other information on the drop test are given in the 1942 "Plating & Finishing Guidebook."

The jet method for determining the thickness of nickel plate is also described in the Guidebook and the solution consists of:

Ferric chloride, $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$	300 grams
Copper sulphate, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$..	100 "
Water	1 liter

Chloride Type Plating Solutions

Dayton, Ohio.

"Gentlemen:

I would appreciate very much if you will send to my attention formulas for making a copper solution using copper chloride, and also a cadmium solution using cadmium chloride.

I have checked all my Plater's Guidebooks for this information, but have not been able to find the information I desire."

U. A. P., Inc.

Dear Sir:

There are no commercial copper plating solutions using copper chloride. Acidified solutions of copper chloride have been recommended for plating on stainless steel, but only flash deposits are applied, to insure adherence of subsequent electrodeposits. Details can be found in U. S. Patents 2,133,255 granted to Raymond Rogers and Pat. 1,892,051 granted to D. Gray and B. K. Northrup. An example of this type of solution is:

Cupric chloride	2 g.
Sodium chloride	20 g.
Hydrochloric acid	500 cc.
Water	500 cc.

The articles are plated for $\frac{1}{2}$ to $1\frac{1}{2}$ minutes at room temp. using a current density of $4\frac{1}{2}$ to 14 amp./ft.² This formula was suggested by G. Buss (Mitt. Forsch. Inst. Probieramts Edelmetalle, pp. 83-91,

Dec. 1938 and pp. 98-105, Jan., March, 1939).

Cuprous chloride has also been used for plating solutions, as the metallic constituent of thiocyanate and thiosulfate baths. These baths also contain sodium sulfite or sodium bisulfite to repress the formation of cupric ions. Details can be found in an Electrochemical Soc. paper by Gernes, Lorenz & Montillon (77, 1940) and in Chem. Zeit., Nov. 6, 1935.

Cadmium solutions using cadmium chloride are not being used commercially either. Gernes, Lorenz & Montillon, in their paper mentioned above, give the formula for a thiosulfate bath containing cadmium sulfate and ammonium chloride. It is possible that cadmium chloride could be substituted for the cadmium sulfate in the formula, since chloride is present in the solution.

—G. B. H., Jr.

Crystallization of Salts on Nickel Anodes

Attleboro, Mass.

"Gentlemen:

Will you kindly let me know how to correct nickel solutions from forming crystal salts all over the nickel anodes. We use 99% nickel anodes.

What quick method should be used to overcome this as I am plating war work, and do not have much time to leave the tanks idle. I think they are what you would call 'passive'."

J. F. B.

Dear Sir:

The information you have given us in your letter is not sufficiently complete to make certain the correct answer is given.

However, it appears that your solution is near the saturation point for nickel salts and we would judge that the salts crystallizing out are the so-called "double" nickel salts or nickel ammonium sulphate. Double nickel salts are much less soluble than are single nickel salts, and double nickel salts can form from single nickel salts and ammonium salts added to the bath, such as ammonium chloride.

The solubility of double nickel salts is approximately 14 oz./gal. at 70° F., and the solubility falls considerably with small decreases in temperature.

We suggest trying to warm the solution if at all possible, to at least, 80° F., and to forego the additions of either double nickel salts or ammonium chloride. In case the solution depletes in nickel, use single nickel salts and if chloride is required, use nickel chloride.

The reason why the salts tend to crystallize in the neighborhood of the anodes is that the nickel ion concentration is considerably higher at the anodes.

We wish to thank J. E. MacQuilken of Standard Steel Spring Co. for sending information on the "Roval" process, and Morris H. Balaban, Ware, Mass., for giving information on a shop problem mentioned in the June issue.

Analysis of Brighteners

Redondo Beach, Cal.

"Gentlemen:

In the chemical analysis of plating solutions, have any methods been developed to analyze brighteners?

P. C. W."

Answer. Regarding analysis of brighteners for plating solutions, your question is difficult to answer due to the many types of brighteners used in various plating solutions.

When simple metallic brighteners are used, such as zinc or cadmium in nickel solutions, or nickel in cadmium solutions, methods based on standard analytical procedures may be used. However, many of the brighteners employed are complex organic substances which are difficult to analyze. In some cases, a potassium permanganate titration for organic matter may be used as a control. However, the best procedure would be to use the Hull cell for control of the brightener. After a few panels have been run with varying amounts of brightener added, an estimation of the brightener can be made by running a panel of the solution to be tested. Panels can be very quickly run and the procedure is relatively simple.

Apparatus for making Hull cell determinations can be purchased from Kocour Co., 4720 S. Christiana Ave., Chicago, Ill. The Electroplating Division of the Dupont Co., Wilmington, Del., have available a reprint discussing the operation of the Hull cell for various types of plating solutions.

Electropolishing of Sterling Silver

Meriden, Conn.

"Gentlemen:

In your June issue you had an abstract of an article entitled "Electrolytic Polishing of Silver" by L. I. Gilbertson and O. M. Fortner. We would like to know something about this with details so we can proceed to use this process if it is practical for a variety of articles.

Could you put us in contact with the proper parties?

D. M. B."

Answer. Regarding "Electrolytic Polishing of Silver," we refer you to preprint 80-5 of the Electrochemical Society, Columbia University, New York, N. Y. This preprint can be purchased for 50 cents.

In summary, the type of solution recommended is essentially that used in silver plating and is composed as follows:

Silver cyanide	4.3 Tr. oz./gal.
Potassium cyanide	7.5 Av. " "
Potassium carbonate	5 oz./gal.

This solution is used at room temperature with current densities above 3 amperes per sq. ft. The length of treating time depends upon the condition of the plate being treated and may vary from 1 to 10 minutes.

The method should be applicable to the electropolishing of Sterling silver. However, we would like to point out that all electropolishing methods accomplish results somewhat equivalent to a so-called "coloring" operation, such as is done with a cloth wheel and lime composition or

rouge. In other words, the process is not suitable for removing deep scratches but is designed mainly to bring up a high lustre on a relatively smooth surface.

Change of Voltage in Chromium Plating

Jacksonville, Florida.

"Gentlemen:

In my review of chromium plating and its applications, I have noticed that current density is one of the most important factors to be controlled, while voltage is given a range of from 3 to 12 volts.

If a part being plated draws 150 amperes from a generator which is operating at 9 volts, but obtains only 5 volts at the part because of voltage drops through the line and through rheostats (the current still at 150), will the finished plate be affected in any way by removing the voltage drops through the rheostats, while keeping the original current density on the work?

Do a range of voltages change the desired finish when a fixed current density is kept?

Any information you may have will be of great help.

N. V. P."

Answer. The problem presented by you has been asked many times.

It can usually be stated that the character of the plate obtained, as well as plating efficiency, is the same provided the amperage is held constant regardless of the manner in which the necessary voltage is obtained, assuming the same type of source of voltage is used.

The only exceptions would be cases where high polarization occurred at the anodes with resulting changes in solution composition, or resulting in the formation of loose particles from the anode that may cause treeing. However, these troubles are not experienced as a rule in chromium plating if the proper anodes are used.

Obviously, the most efficient procedure would be to try to lower the primary voltage source to obviate the need for resistors in the circuit, inasmuch as the use of resistors or rheostats merely means a waste of power. The same plate will be obtained whether the generator be operated at 9 volts and resistors used, or whether the generator is operated at exactly the correct voltage to obtain the 150 amperes of current and no resistors or rheostats are used.

A Comparative Study of Oils for Black Oxide Coatings

(Concluded from page 364)

other cases dry, waxy or resinous in nature. The particular requirements of a given application will determine what type of film may be used. The protective value of these various films will also vary. In general, the dry waxy type of film is less protective, but in many applications it is the most desired.

The films obtained with soluble oils may be either oily or mildly greasy in nature and their thickness can be

varied within rather wide limits. Their exact nature cannot be adequately described and for this reason a prospective user should choose the oil most suited to his needs after examining the films produced by examining oils using several dilutions in each case.

Effect of Concentration of Soluble Oil in Emulsions

The results obtained with various concentrations of soluble oils in emulsions are given in Figure 2. In general there was a direct relation between emulsion concentrations and the salt spray resistance.

The general procedure with all soluble oils was to immerse the test plates in the hot agitated emulsion for 30 seconds and then mount immediately on racks for draining. The racked samples were then allowed to stand for twelve hours or overnight before starting the test. With this procedure, the lowest concentrations did not wet the entire surface of the plate and this led to their early rusting. Undoubtedly if the oil emulsion had been "worked in" or left in the oil emulsion for a long period the lower concentrations would have shown much better resistance to salt spray.

Concentrations greater than 50 to 60 percent are not practicable due to the slow and incomplete drainage thus using excessive amounts of oil. In the case of oil "O" there was little or no improvement when the undiluted oil was used.

Soluble oils are being successfully and economically employed for protecting various oxide coated parts during assembly, inspection and storage. They are being used very satisfactorily for permanent protection of oxide coated parts of enclosed assemblies of instruments and dial gauges. In certain cases they are applied without dilution as slushing compounds. The better grade soluble oils now available appear to be worthy of extended use and based upon their comparative salt spray rating might be substituted for the more strategic sperm oil in certain applications.

1. Contribution from the Alrose Chemical Company, Cranston, Rhode Island.

2. Alrose Chemical Company, Cranston, Rhode Island.

3. Consultant, A. Kenneth Graham & Associates, Jenkintown, Pa.

4. Salt Spray Evaluation of Oiled Black Oxide Coatings on Steel, METAL FINISHING, 40, p. 254, May (1942).

Patents

Porous Anode

U. S. Pat. 2,273,036 and 2,273,798. G. W. Heise and E. A. Schumacher, assignors to National Carbon Co., Inc., Feb. 17, 1942. A process for depositing copper and iron and for oxidizing salts using a porous anode having a porosity between 40% and 70% and an air permeability above 30 and comprising comminuted solid carbonaceous material embedded in a porous carbonaceous binder having uniformly distributed pores.

Etching Metals

U. S. Pat. 2,273,665. A. D. Small, assignor of one-third to O. G. Krayner, Feb. 17, 1942. An etch for production of designs on stainless steel, tin, chromium plate and like metals consisting of:

Mercuric nitrate	1 oz.
Muriatic acid	1 oz.
Ferric chloride	0.5 oz.
Nitric acid	0.5 oz.
Ethanol	4 oz.
Water	4 oz.

This solution is applied for about 15 seconds, preferably warm. If the design is dark colored after etching, it can be brightened by treatment with a 10% solution of chromic acid.

Corrosion Prevention of Iron and Steel

U. S. Pat. 2,275,223. R. H. Hardoen, Mar. 3, 1942. A method of rustproofing iron and steel comprising subjection to direct current of approximately 3.5 amp./dm.² in a solution containing approximately 20-25% alkali hydroxide such as sodium hydroxide, using as anode a metal selected from the group consisting of copper, chromium, tin, zinc, manganese, nickel and lead, whereby there is deposited on the articles a magnetite analogue of the anode metal.

Corrosion Prevention of Magnesium and Alloys

U. S. Pat. 2,276,286. R. W. Buzzard, Mar. 17, 1942. Production of corrosion resistant coatings on magnesium or magnesium alloys comprising anodizing in a bath containing phosphate and chromate, the pH being on the acid side, subjecting the anodized article to an aqueous solution containing manganese sulfate and a water soluble compound selected from the group consisting of chromates and dichromates, and then immersing in a drying oil selected from the group consisting of tung oil, linseed oil and fish oil at about the boiling point of water until evolution of gas ceases. Also petroleum base oils, waxes and resins.

Examples:

1. Anodizing Bath: Dichromate 10%
Phosphate 2%
2. Sealing Bath: Dichromate 10%
Manganese sulfate 10%
90°-150°F. Immersion for 20 min.
3. Oil Bath: Immersion in tung oil at 90°-150°C.

Corrosion Prevention of Metals

U. S. Pat. 2,276,353. J. S. Thompson, assignor to Parker Rust Proof Co., Mar. 17, 1942. A process of treating surfaces of metals included in the group consisting of iron, steel, zinc, aluminum and their alloys, which comprises subjection to an acidulated, heated solution containing as its chief active ingredients, the SiF₆ radical and a compatible oxidizing agent of the group consisting of nitrates and compounds of hexavalent chromium and treating until a visible protective paint-holding coating is obtained and thereafter applying a paint, lacquer or enamel coating.

Examples:

Aluminum:	Hydrofluosilicic acid 15 cc./l.
	Chromic acid 2.5 g./l.
Steel:	Hydrofluosilicic acid 12.5 cc./l.
	Chromic acid 5 g./l.
	Sodium nitrate ... 10 g./l.
Zinc:	Hydrofluosilicic acid 10 cc./l.
	Chromic acid 5 g./l.

These solutions are operated at about boiling and immersion for 5 minutes produces gray coatings on aluminum and zinc and black coatings on steel.

Zinc Plating

U. S. Pat. 2,277,668. C. F. Ruebensaal, assignor to E. I. duPont de Nemours & Co., Mar. 31, 1942. A zinc bath free from cyanide and comprising essentially sodium zincate and about 7 to 30 g./l. of a substance selected from the group consisting of glycollic acid and its salts.

Organic Coating

U. S. Pat. 2,280,862. B. E. Sorenson, assignor to E. I. duPont de Nemours & Co., Apr. 28, 1942. The process of preparing modified oils and resinous materials which comprises refluxing fatty unsaturated, non-hydroxylated oils containing substantially no conjugation and maleic acid esters of unsaturated alcohols.

Electroforming

U. S. Pat. 2,082,022-3. J. W. Bishop & A. W. Bull, assignors, by mesne assignments, to United States Rubber Co., May 5, 1942. A process and machine for producing pneumatic tire-molds by electroforming, including a rotating matrix which is sprayed with molten metal during rotation in order to increase the thickness of at least a portion of the electrodeposit.

Metal Spray Gun

U. S. Pat. 2,282,214. F. O. Albertson, assignor to Albertson & Co., Inc., May 5, 1942. A metal spray gun of novel design which includes an electric heating element thermostatically controlled for both operating and holding temperatures.

Immersion Deposits

U. S. Pat. 2,278,722. J. Loiseleur, assignor to Societe Anonyme des Manufactures des Glaces & Produits Chimique de St. Gobain, Chauny & Cirey (France), Apr. 7, 1942. A method of obtaining immersion deposits of metals more electropositive than hydrogen

on metallic and non-metallic surfaces, comprising rendering the surface adsorbed to a molecular layer of ions, applying said layer by treating with an alkaline solution of a metal ion electropositive to hydrogen, removing excess ions by thorough rinsing, and metallizing the surface by means of a solution containing a ferrous salt, an hydroxy acid and a salt of the metal to be deposited.

Example:

Silver deposits on cellulose acetate:

1. Immerse at 25° C. for 5 min. in a solution of 15 g. quinone in 1,000 g. water.
2. Rinse and immerse for 5 min. in a solution containing ¼ molar cupric hydroxide and 2 molar ammonia at 25° C.
3. Rinse and immerse in tenth molar stannous salt solution containing 0.5% phenol.
4. Rinse and immerse in 0.001 N auric hydrate.
5. Rinse and silver by the reduction process, as usual.

Chromium Bath

U. S. Pat. 2,279,830. J. J. Murray, Apr. 14, 1942. A plating bath comprising chromic acid and a minor portion of chlorinated acetic acid.

Example:

Water	1 gallon
Chromic acid	36 oz.
Monochloroacetic acid	2-9 oz.
Temp.=	90-130° F.
C. D.=	111 amp./ft. ²
Effic.=	up to 37%

Galvanizing Kettle

U. S. Pat. 2,285,364. C. J. Schipplock, assignor to Crane Co., June 2, 1942. A galvanizing kettle with an independent means for directing the heating fluid onto the outer surface of said kettle.

Barrel Plating

U. S. Pat. 2,285,553. H. G. Arlt, assignor to Bell Telephone Laboratories, Inc., June 9, 1942. An apparatus for barrel plating magnetizable articles, including a means of agitation and an electromagnetic winding.

Purifying Galvanizers Skimmings

U. S. Pat. 2,285,573. S. F. Dubs, assignor to Morris P. Kirk & Son, Inc., June 9, 1942. A method of removing ammonia and ammonium compounds from galvanizers sal-ammoniac skimmings for the purpose of producing zinc chloride which is substantially free from ammonium compounds which includes the steps of: heating to about 300° C. to melt the skimmings, holding at this temperature until the free ammonia has vaporized; raising the temperature to about 450° C.; agitating until all the zinc ammonium chloride has been vaporized, dissolving the residue in water, adding hydrochloric acid to convert any zinc oxide to zinc chloride and then filtering to remove insoluble matter.

This Is Washington —

BY GEORGE W. GRUPP

METAL FINISHING'S Washington Correspondent

Snow-Storm of Orders

During the past month there has been a snow-storm of new orders and regulations issued by the various Government departments and agencies. As a result businessmen do not know from one day to the next what will come out of Washington. All of these orders require more and more additional clerical help to meet the paper work required by the Government.

WPB Exodus

Strange as it may seem, there is an exodus of War Production Board employees returning to private enterprise because of the increased personnel demands of industry due to the inroads of the draft.

Allocation Classification System

The War Production Board expects to control and trace the flow of materials from primary producers to finished products ordered or contracted for after June 30, 1942 with its new Allocation Classification System, as ordered by Priorities Regulation No. 10. Each order and contract will now be given a Purchasers' Symbol such as USA for the Army and LL for the Lend-Lease Administration. And since all goods have been placed into twenty-three general classes the commodity, article, thing or service ordered or contracted for must bear an Allocation Classification number. Every manufacturer, fabricator, dealer or primary producer must place these symbols on his order, contract and correspondence.

Some Metal Finishing Symbols

The symbol 8.10 must be used by companies engaged in rolling and drawing of non-ferrous metals; operation of aluminum plants; brass mills; copper mines; copper refineries; non-ferrous metal foundries; and those engaged in the manufacturing of lead and lead foils, sheet metal, and tin and other foils. The symbol 8.20 must be used by companies engaged in the manufacturing of such chemical products as acetone, acids, chlorine, lacquers, shellac, and sodium compounds. Another example is the symbol 12.20 which must be used by companies engaged in the manufacturing of surgical and dental instruments and health equipment.

Aluminum Plant Expansion

Four of the seven Government owned aluminum plants being built by the Aluminum Company of America were placed in operation during the past month, and the other three are expected to get under way by August first. These seven plants will have an annual capacity of 640,000,000 pounds of aluminum. Another expansion of the same capacity is expected to begin operations about December first.

Aluminum Products Price Reductions

The price reduction schedule of fabricated aluminum products which was previously announced to take effect June 15th was postponed to July first by the Office of Price Administration. Large savings to the Government are to result from these reductions according to Price Administrator Henderson.

Aluminum Scrap Price Warning

Price Administrator Leon Henderson has issued a warning that some scrap dealers are not only exposing

themselves to suspension or revocation of their licenses but also laying themselves open to criminal penalties, civil enforcement actions and suits for treble damages provided for in the Emergency Price Control Act of 1942 in their buying and selling aluminum scrap on an "as is" basis. It is the opinion of Price Administrator Henderson that "buying and selling on an 'as is' basis involves a rough estimate of the percentage of foreign matter in the scrap and brings danger of violation of the schedule. If the estimate is low and proper deduction is not made for the actual contamination, the price paid will be above the permitted maximum, and penalties will be incurred."

Aluminum Substitutes

In an effort to save aluminum, magnesium and other strategic metals for combat planes, the Army is using as substitutes plastics, plywood and other materials in training airplanes. For example, in the single engine Advanced Trainers AT-6 approximately 1246 pounds of aluminum will be eliminated. This saving on 1000 planes will provide enough aluminum for 400 pursuit planes or for 150 medium seized bombers.

Ammonia Order

The WPB General Preference Order M-163 has banned the production and distribution of by-product ammonia and sulphate of ammonia unless special permission has been granted by the Director of Industry Operations. On the 10th of each month each producer and distributor of these products must file, for approval, in triplicate, Form PD-237 with the Chemical Branch of the War Production Board, Washington, D. C., a list of his proposed schedule of deliveries for the forthcoming month.

Automotive Exhaust Valves

In an effort to conserve large quantities of metal, the War Production Board issued on June 17, 1942, Limitation Order L-128, effective July 1st. This Order specifies the maximum amount of chromium and nickel which may be used in the production of exhaust valves for different sizes of passenger cars and motor trucks. For example, the exhaust valves for passenger cars and light motor trucks are limited to 9% of chromium and no nickel; medium and heavy motor truck exhaust valves may contain 21% of chromium and 1.5% nickel; and if the piston displacements of automotive engines are in excess of 300 cubic inches the exhaust valves may contain 20% of chromium and 9% of nickel.

Axis Owned Patents Seized

During the first two weeks of June Alien Property Custodian Leo T. Crowley seized 1,200 German and Italian owned patents which he has made available to American industry. Among these patents were the chemical patents of the Deutsche Gold und Silber Scheideanstalt and the Deutsche Hydrierwerke.

Beryllium

Beryllium ores and concentrates and benefited and treated forms, "glucinum" in commercially pure form, alloys containing 3% or more by weight of the element beryllium, chemical compounds containing beryllium as an essential and recognizable component, and all scrap or secondary materials containing commercially recoverable beryllium have been placed under complete allocation control by War Production Board Gen-

eral Preference Order No. M-160 on beryllium and effective July 1st. Henceforth consumers must file on Form PD-494 by the 20th of each month their request for the preceding month's allocation; and on the first of each month they must report to the WPB on Form PD-497 all beryllium content in their possession or control in excess of ten (10) pounds.

Blackplate Closures Restricted For the purpose of saving about 51,000 tons of blackplate and 1,500 tons of tin per annum, some 70 manufacturers of closures, 500 brewers, 6,300 bottlers, 1,100 wineries, and 250 distillers will be affected by the issuance of amended May 30, 1942 Conservation Order M-104 on Closures for Glass Containers. For clearness sake it should be noted that previous orders on this commodity were labeled "Tinplate and Terneplate Closures for Glass Containers." Beginning June 1st manufacturers of malt beverages and non-alcoholic beverages closures have been restricted to 60% of their monthly consumption of tinplate, terneplate or blackplate in the corresponding calendar month of 1941. The Order provides that no tinplate, terneplate or blackplate shall be used for the manufacture of cover caps or metal screw bands for two-piece home canning closures, and for commercial glass food containers. It also stipulates that tinplate, terneplate or blackplate shall not be used for the manufacture of double shell or semi-double shell caps "unless one shell thereof is made from waste or scrap material."

Brass Prices The March 1942 price lists of the American Brass Corporation, General Cable Corporation, Revere Copper and Brass, Inc., Bridgeport Brass Company and Anaconda Wire and Cable Company were recognized by the Office of Price Administration on June 12, 1942 as the price ceilings of fabricators selling their excessive or frozen inventories of brass and wire mill products if they cannot determine their ceilings under the General Maximum Price Regulation. The products included in this Order are new plates, sheets, strips, rolls, coils, wires, rods, bars, tubes, tubing, pipes, extrusions, forgings and anodes made from copper or 40% copper base alloy. This Order does not apply to coil, rod, wire and other shapes covered in the Wire, Cable and Cable Accessories Revised Price Schedule No. 82.

Church Goods Restrictions No manufacturer, according to General Limitation Order L-136, is permitted to produce or assemble any church goods containing aluminum, cadmium, chromium, copper and copper base alloys, cork, phenolic plastics, methacrylate plastics, lead (except solder), magnesium, mercury, nickel, rhodium, rubber, silk, tin, tinplate, zinc and alloy steel after June 23, 1942. The use of gold and silver, however, is unrestricted.

Chromium The consumption of chromium in the United States in 1942 is expected to reach 960,000 tons. The Government is spending about \$10,000,000 and private industry about \$1,500,000 to develop the low-grade chromium ores of Montana, California and Oregon. The Montana project is expected to yield about 500,000 tons of 40% chromium concentrate a year.

Cobalt Amendment No. 1 of Conservation Order M-39-b of June 3, 1942, provides that cobalt cannot be used in the manufacturing of ground coat frit. However, cobalt nickel oxide may be used. The "sale or use of existing inventories of ground coat frit containing cobalt in commercially non-recoverable form," the Order says, is not restricted by the amendment.

Construction Order Interpretation The War Production Board's Interpretation No. 1 of Conservation Order No. L-41 on Construction issued on June 6, 1942 makes it clear that when WPB authorizes the remodeling of an industrial plant, the owner may

spend in addition up to \$5,000 during any twelve month period without additional authorization. And all used material and equipment belonging to the owner, and the labor costs in utilizing these used articles, need not be included in the estimated total cost of construction.

Contract Prices and Taxes A bill which provides for a withholding of 10 per cent on naval contracts and sub-contracts for the payment of delinquent Federal income and excess profits taxes was introduced by Representative W. Sterling Cole. The proposed measure directs that the withheld sum must be deposited with the Treasury Department at the rate of 4% per annum until applied to tax payments due or until refunded to the contractor.

Control of Instrument Production The War Production Board has taken control of the production and distribution of industrial indicating, recording and controlling instruments, instrument ends, instrument connections, control valves, safety valves and regulators in an effort to save 283,000 pounds of nickel and 60,000 pounds of chromium by the issuance of Conservation Order No. L-134. Under this Order manufacturers are prohibited from processing any chromium, nickel or alloys of these metals in the production of the items mentioned except under operating conditions specified by the WPB Division of Industrial Operations. And such items may only be delivered to one who has a preference rating of A-10 or higher.

Copper Because of the increasing war demands the current outlook of copper is one of constant growing shortage. As a result, steel will be used instead of brass in shell casings wherever possible, and silver may be used in a limited way, instead of copper, as a conductor of electricity. To step up the production of this vital metal, over-all ceiling prices are being paid for copper and a premium price plan has been set up which provides monthly rewards for producers who exceed their quotas. The 1942 copper supply is expected to reach 1,800,000 tons from domestic production and imports. In addition to that, there will be available an additional 300,000 tons recovered from scrap. At the present time the Government is spending over \$180,000,000 and private interests \$40,000,000 in developing copper production.

Cutlery Production Limited Because of a shortage of metals the WPB has issued General Limitation Order No. L-140 which provides that manufacturers of knives, forks, spoons, spatulas, including silver-plated flatware used for serving or eating food, scissors, folding blade knives, manicuring and pedicuring instruments, and blackhead extractors may use not more than 35 to 60 per cent of iron, steel, silver and gold consumed in the production of such items in each equivalent quarter during the base period of July 1, 1940 and June 30, 1941. All persons coming under this order must keep complete records on inventories, production and sales. These records are subject to audit and inspection by the WPB.

Dealers Must Register All dealers selling salvage, scrap and waste materials to industrial consumers must register with the Office of Price Administration. Upon filling out the required Registration Statement the dealer must mail it to the Bureau of Census, Washington, D. C., after which he will receive a Registration Certificate. Price Administrator Leon Henderson declared that this licensing and registration of dealers in aluminum scrap, zinc scrap, nickel scrap, brass mill scrap, iron and steel scrap, copper and copper alloy scrap, and lead scrap is imperative for effective price control purposes.

Financial Reports Requested The Accounting Division of the Office of Price Administration under the direction of H. F. Taggart

is requesting all manufacturing, mining, contracting and distributing corporations who have assets in excess of \$250,000 to submit annual and interim financial reports. These reports are requested for two reasons. First basic information on costs and profits for different industrial groups is necessary to place sound price ceilings on commodities. And second, these reports will be helpful to firms who wish price adjustments. Two forms are used to obtain this information. Form A is a comprehensive analytical annual financial report. Form B must be used for quarterly reports.

Industrial Equipment

General Limitation Order L-125 which restricted deliveries on many types of general industrial equipment on and after May 26, 1942 was supplemented by Interpretation No. 1 issued on June 13, 1942 which provides that such equipment will be considered delivered if it was in the hands of a common carrier or contract carrier for shipment to the buyer on or before May 26, 1942.

Inventory Control To Be Tightened

Chairman William L. Batt of the WPB Requirements Committee forecast stricter allocation and tighter inventory control of fabricators requiring more than \$5,000 worth of scarce metals.

Magnesium

It is predicted that the total production of magnesium this year will be about 170,000,000 pounds. This production capacity is in the process of being increased to 600,000,000 pounds a year at an expenditure of \$319,000,000 by the Government and \$20,000,000 by private industry.

Manganese

The consumption of manganese in the United States in 1942 is expected to exceed 1,000,000 tons. At the present time plans are being made to produce 600,000 tons of manganese from domestic low-grade ore. This development will cost the Government about \$40,000,000 and private interests about \$6,000,000.

Metal Office Furniture

W. A. Adams, Chief of the Furniture and Bedding Branch of WPB, has stated that no amendment is being considered to lift the production curtailment of metal office furniture as directed by Order L-13-a. He made this statement because of the rumors that there would soon be a relaxation of the Order.

Metal Signs

Amendment No. 1 to Limitation Order L-29 exempts all metal signs 36 square inches or more in size which are used as mechanical or electrical traffic warning lights and signals for "use on railroads, grade crossings and highways."

Musical Instrument Production Curbed

The production of musical instruments containing more than 10%, in weight, of such critical materials as iron, steel, lead, zinc, magnesium, aluminum, rubber, copper and copper base alloy, tin, phenol formaldehyde plastics, methyl methacrylate plastics, Neoprene, cork, nickel and chromium has been stopped by WPB Supplementary Limitation Order L-37-a. In this Order the present stocks of 27 manufacturers, jobbers and wholesalers were frozen to make them available to the Army, Navy and Marine bands of the United States.

Plant Efficiency

Readers of METAL FINISHING should send for a copy of the booklet on "Plant Efficiency" which has just been issued by the Division of Information of the War Production Board. This 39 page booklet is packed full of practical data on good lighting, accident reduction, adapting old machines to new jobs, maintenance and repairs, Government standards, personnel training, swing shifts, plant protection, pooling facilities, priorities, how to get into war work, and how to keep track of orders, production and materials.

Platinum Control

Platinum or any platinum compound or alloy with more than one per cent of platinum and all articles containing platinum or platinum alloys such as dental alloys and appliances, electrical equipment and parts, fuse wire, glass furnace parts, industrial equipment, jewelry, laboratory equipment, catalysts, rayon spinnerets and thermocouples cannot be sold or transferred except to known dealers, consumers, distributors and processors who are not engaged in the smuggling of platinum out of the United States for Axis powers. General Conservation Order No. M-162 provides that every person possessing one or more troy ounces of platinum or platinum alloy must report his inventory on Form DP 513.

Plumbing Fixture Restrictions

The use of metal has been restricted in the manufacturing, processing, fabricating and assembling of plumbing fixtures by Limitation Order L-42. This Order will have some effect upon the electroplating business.

Porcelain Enameled Utensil Committee

The WPB has appointed a Porcelain Enameled Utensil Industry Advisory Committee consisting of F. S. Earnshaw of the United States Stamping Company of Moundsville, W. Va.; Ralph M. Fawcett of the Republic Stamping and Enameling Company of Canton, Ohio; D. S. Hunter of Enameled Utensil Manufacturing Council of Cleveland, Ohio; Frank E. Jones of the Jones Metal Products Company of West Lafayette, Ohio; W. F. Lewis of Lisk Manufacturing Company of Canandagua, N. Y.; W. J. Vollrath of Polar Ware Company of Shoboygan, Wis.; and Anthony F. Bisgood, Section Chief, Consumers' Durable Goods Branch of WPB, as the Government Presiding Officer.

Portable Lamps

The War Production Board redefined "portable lamps" in the recently issued Amendment No. 2 to Portable Electric Lamp Shade General Limitation Order L-33. The amendment reads: "Portable Lamp" does not include any flashlight or other battery-operated lighting device, mechanic's lamp, industrial lamp designed specifically for use in conjunction with any industrial machine, tool, or assembly bench or other similar factory equipment, or any overhead suspended fixture (whether portable or not)."

Priority Regulation No. 11

In an over-all effort to coordinate control of the acquisition, distribution, and use of metal and materials by users of more than \$5,000 worth in a calendar quarter the WPB issued Priorities Regulation No. 11 on June 10, 1942. All of those coming under this Regulation had to file a Production Requirement Plan application for a PRP Certificate granting a preference rating. Those who did not receive their PRP Certificate prior to July 1st may apply or extend preference up to 40% of the amount indicated in the application until the Certificate arrives provided the applicant has been operating under the Production Requirement Plan prior to the issuance of Regulation No. 11.

Priorities Regulation No. 11 Metal Coverage

The metals and oxides included in Priorities Regulation No. 11 are aluminum, aluminum chloride, aluminum fluoride, refined aluminum oxide, antimony, antimony oxide, antimonial lead, arsenic, brass, bronze, beryllium, babbitt metal, bismuth, copper, cupro-nickel, chrome nickel, cadmium, cobalt, chromic oxide, chromite, cobalt oxide, copper sulfate, iridium, lead, lead carbonate, lead oxide, lead prooxide, lead sulfate, magnesium oxide, mercury, mercuric oxide, mercury chlorides, molybdenum, molybdenum oxides, metal carbides, monel, nickel, nickel oxide, palladium, platinum, platinum-iridium alloy, potassium chloride, potassium chromite, potassium dichromate, rhodium, ruthenium, solder, sodium chromate, sodium bichromate, sodium tungstate, tin, tin chlorides, titanium dioxide, tungsten, tungsten ores and oxides, vanadium oxide, zinc, leaded zinc oxide, lead free zinc oxide, and zinc sulfate.

Space-Heating Equipment

General Limitation Order No. L-107 of June 13, 1942 limits the shipment of extended space heating equipment made of copper or copper base alloys or other non-ferrous metals to the Army, Maritime Commission, Coast Guard and Navy. Exceptions to this Order must be had from the Director of Industry Operation of WPB by making application on Form PD-467.

Tin Allocations

The Director of Industrial Operations of WPB issued on June 17, 1942 Amended Preference Order No. 43 on Tin. In this amended Order no changes were made as to either the method of allocation or the general effect upon tin users. The chief change is the removal of obsolete provisions from the original Order issued December 17, 1941.

Tin Can Substitute Campaign

The Bureau of Industrial Conservation of WPB has started a nation-wide campaign to get food packers and processors to substitute, wherever possible, tin cans by paper, cardboard, and corrugated paper containers, wooden boxes, pails and barrels and glass containers in the packing and shipping of foodstuffs.

Tin, Electrolytic Pig

The Office of Price Administration issued on June 17, 1942, and effective June 22, 1942, Amendment No. 2 to Revised Price Schedule No. 17-1 on pig tin to permit the sale of electrolytic processed pig tin at the same price of Grade A tin. This amendment also has a provision which permits a 1¼ cents per pound differential if "at the request of the buyer the tin is melted and poured into molds and is sold in special shapes weighing not more than seven pounds." However, for shapes weighing more than seven pounds, the 1¼ cents differential is not allowable.

Tinplate Substitutes Ordered

On June 13, 1942 the WPB issued Tinplate and Terneplate Supplementary Order No. M-81-a which provides that the manufacturers of tin cans for many different kinds of vegetables, fish, fats and other products must substitute wherever possible tinplate and terneplate for chemically treated blackplate, and hot dipped tinplate for electrolytic tinplate. These substitutions, it is believed, will result in a saving of 24,000 tons of tin for more critical purposes.

Tin Restrictions

The use of tin in non-critical products was cut another 10 per cent, effective July 1, 1942, according to Conservation Order No. M-43-a on Tin as amended on June 5, 1942. Not more than 30% of the amount of tin used for a corresponding calendar quarter of 1940 is permitted after July 1st in the manufacturing of such non-critical articles as advertising specialties, art objects, band and other musical instruments, buckles, buttons, emblems and insignia, fasteners, jewelry, ornaments, slot machines, toys, and for plating or coating purposes.

Water Distributing Systems

Interpretation No. 4 of Copper Conservation Order M-9-c issued on June 15, 1942 prohibits the use of copper and copper alloys in the manufacture of pipes and fittings used in any water distributing and supply system. This interpretation does not apply to water meters or to pipes and fittings for the plumbing systems in buildings as provided in Order M-9-c and Order L-42.

War and Health

The defeat of the Axis powers not only depends upon fighting men but it also depends upon ships, arms and supply production; and that production depends upon the health of the workers in shipyards, ordnance plants, copper rolling mills, brass foundries and electroplating establishments.

Metal Finishing Specialists

There are two specialists at the National Institute of Health who know thoroughly the industrial health problems of the metal finishing industries. And what is more they are always glad to be of service to the industry. Dr. W. C. Dessen is an up and coming young expert on metal poisoning and industrial dust problems; and Dr. Louis Schwartz is a dermatologist (one skilled in occupational diseases of the skin), who has an amazing understanding of the various processes and kinds of electroplating and of other non-ferrous industrial methods.

Dangers of Anodizing Fumes

Dr. Schwartz finds that the splashes and fumes of anodizing and other tanks containing chromic acid and dichromates, hydrofluoric acid and other irritants causes dermatitis on intact skin and ulcers where the skin has abrasions. Various solvents used in anodizing and degreasing tanks defat the skin, and cause a dry, cracked, fissured eczema of the arms and hands. Strong soaps or bleaches should not be used by such workers to clean their skin. Instead they should use neutral sulfonated castor oil with 2 per cent Aerosol, Duponol, Igepon, Nacconol, or Santomerse which will clean the skin and not defat it. And those workers who have a dry or chapped skin should use hydrolanolin and olive oil as a buffer against fat solvents.

Electroplating Danger Preventives

As a general protection against electroplating acids and fumes, Dr. Schwartz recommends that the workers be instructed to wear long rubber gauntlets, rubber boots, and long oil and acid proof aprons. The nasal orifices should be loosely plugged with cotton smeared with vaseline and changed three times a day to protect the nasal mucosa against chemical corrosion. The hands and face should be smeared with lanolin and castor oil. The eyes should be protected against strong fumes by goggles.

Metal and Silica Dusts

Metal and silica dusts in large quantities not only irritate the upper air passages but they also convey infection which may cause one of many forms of pneumoconiosis (disease of the lungs) because these dust particles break down the respiratory tract's natural defenses, penetrate the parenchymal tissues, proliferate the fibrous tissues and form nodules. As protection against dermatitis while working with abrasives, cyanides, solvents and lime, with lacquers, resins, solvents and dyes, and with acids and zinc chloride while soldering or welding, the workers should use rubber gloves, wear close woven garments, zipper closed canvas overalls, and dust masks. They should always keep their faces, hands and bodies as clean as possible and make a daily change of clothes.

Carbon Monoxide Poisoning

The Institute is constantly carrying on experiments and making studies on ways and means of combating carbon monoxide poisoning of chargers, cleaners, coremakers and cupola men working in copper, lead and zinc smelting plants and brass foundries.

Cadmium Poisoning

One of the most recent studies made by Dr. Louis Schwartz and others of the National Institute of Health is that of cadmium poisoning from the absorption of cadmium dust, fumes and vapor into the respiratory system by cadmium alloy and compound makers, cadmium platers, zinc smelting chargers, smelters and refiners, electroplaters, cupola tenders, polishers, grinders and buffers. These medical specialists found that in cadmium and chrome plating the hazard is curbed by properly designed exhaust ventilation, by requiring workers to wear positive pressure masks in an atmosphere of high cadmium content, and by getting them to wear good respirators with soda lime cartridges in an atmosphere where the cadmium content is low.

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

Masking Material for Welding Spatter

Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Cal., have announced the development of a new product called "Turco Weldmask", which was developed to prevent molten particles, normally spattered during welding, from attaching themselves to the area surrounding the weld.

The material is claimed to be easily applied with a brush to the area most apt to be spattered, usually about 3" on both sides of the joint. The welding may be done through the masking material and tests show it has no effect on the weld. After welding, the residue and spattered particles can be removed with a hand wire brush, thus obviating the necessity for chipping with a hammer and chisel.

The material is stated to be a creamy white liquid, non-injurious to the skin of the operator and to be non-inflammable. It can be used on steel, stainless steel, aluminum and magnesium. Because the material is non-drying, it can be applied immediately or several hours before welding. The product is soluble in water and thus no inflammable solvents are required for its removal.

Addition Agents for Chromium Plating

Zialite Corp., 143 Exchange St., Worcester, Mass., have announced that their addition agents for chromium plating baths are being used by an increasing number of hard chromium platers, doing war work.

It is stated that the use of these agents results in denser and harder deposits from such baths as compared with the usual baths without the addition agents. It is also stated that greater throwing power is obtained by the use of the addition agents.

The company states that they will send upon request small samples of steel plated at 135° F. and 430 amperes per sq. ft. for the same length of time. One sample was plated in the ordinary chromium bath and the other in a bath made with the company's addition agents. It is claimed that the sample plated with addition agents takes from 5 to 10 times as long to strip with hydrochloric acid than do the samples obtained in the regular chromium plating bath.

Palladium Plating Solution

Precimet Laboratories, 64 Fulton St., New York, N. Y., have announced the development of a new palladium plating bath called, "Pallite".

Palladium is a sparkling white metal approaching rhodium in color. It is of the platinum group and is, therefore, relatively immune to tarnish. The solution for plating palladium, according to the company, is a simple, flexible bath and is easy to operate, and plating can be done uniformly over a period of continuous or intermittent use. It is claimed that the palladium is relatively less expensive than platinum or gold, due to the lower specific gravity of palladium, and its lower price. The deposits obtained are stated to be hard and bright, and can be plated directly upon most all basis metals.

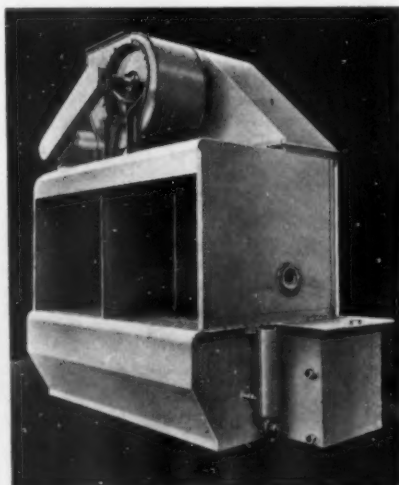
Palladium is not on the priority list and no royalties or licensing are required for use of the bath. A concentrated palladium solution is supplied which is diluted and is then ready for plating.

The company is prepared to send full details of the bath to those interested.

Magnesium Dust Collecting Booth

Industries working with magnesium will be interested in learning about the further developments that have been made in the "Hydro-Whirl Magnesium Booth," according to its manufacturers, Industrial Sheet Metal Works, Detroit. The factor of safety has been stepped up and the design also has been improved, on which patents have been issued.

Instead of being made of steel, the bench-high grating of the compartment where the work is done is made of hardwood, which will not produce sparks if struck with a grinding wheel or tool. Thus, the possibility of having sparks ignite the magnesium dust created by the grinding, buffing, or



Magnesium dust collecting booth.

polishing operations performed within the booth is removed and danger of fire is practically eliminated. As an added protection against spark ignition, the booth sections are lined with Masonite.

An automatic control maintains the water level at a uniform height in the tank below the grating. Thus the tank will never run dry to endanger the safety of the operator.

Vacuum Pickup for Abraser

The Taber Instrument Corporation of North Tonawanda, N. Y. has announced its improved "Abraser Vacuum Pickup", Model HV-42, an accessory to the Taber Abraser standard method for measuring resistance to abrasion of surface finishes.

The primary function of the vacuum pickup is to prevent accumulation of abrasives from interfering with the normal wear action of the "Calibrase" wheels. Its principal application is for the removal of abrasives that may become imbedded in the weave of textile fabrics, also the fine powder from certain types of organic coatings that tend to cling to and build up on the face of the Calibrase wheels.

The pickup is of tubular design for stand-

Professional Directory

G. B. HOGABOOM JR. & CO. Consulting Chemical Engineers

SALT SPRAY TESTING — CERTIFIED TO MEET ARMY AND NAVY SPECIFICATIONS. Testing of deposits—thickness, composition, porosity. Solution analyses, plant design, process development.
44 East Kinney St. Newark, N. J.

Joseph B. Kushner, Ch.E. Metal Finishing Consultant

Plating plants streamlined for defense work.

233 W. 26th St., N. Y. C.

All plating solutions analyzed for one dollar each. Reagent solutions for analyzing at reduced prices.

Platers' Laboratory Service
57 Broad St., Elizabeth, N. J.

CHROMIC ACID

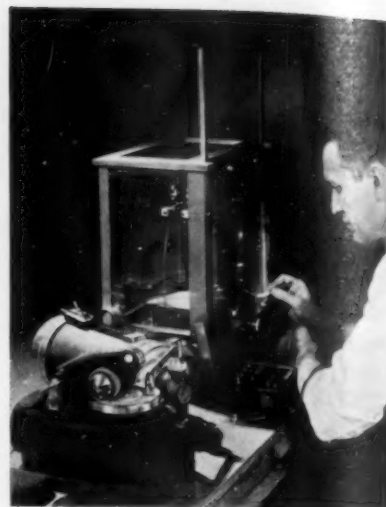
99.75% PURE

With two complete, independent plants at Jersey City and Baltimore, and its own supply of the basic raw material Chrome Ore from company owned and operated mines, Mutual is the world's foremost manufacturer of Chromic Acid.

BICHROMATE OF SODA
BICHROMATE OF POTASH

Mutual Chemical Co. of America

270 MADISON AVENUE, NEW YORK

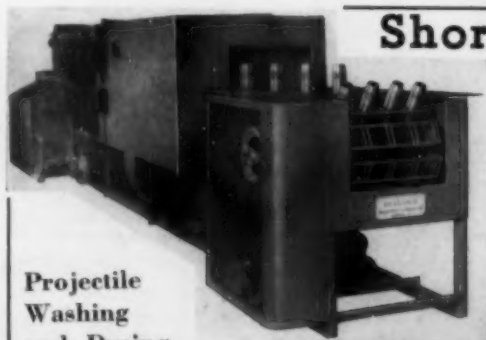


Vacuum pickup for abraser.

ing on the table alongside the abraser and has a nozzle rotatively mounted on the suction end of the housing so as to swing in and out of position relative to the specimen holder. The nozzle holder can also be adjusted vertically to the proper height above the specimen by turning the knurled collar located on the stem. The contaminated air is drawn through the nozzle and connecting tube into the high speed centrifugal pump, then through a special filter bag which passes only clean air back into the room. The bag can be quickly and conveniently removed for emptying by unsnapping the two catches holding the exhaust and to the main unit permitting the cloth receptacle to be lifted out for cleaning.

The motor is the high speed universal type designed for operation on any electrical circuit of 110 to 120 volts. The toggle switch for starting and stopping the motor is conveniently located at one end of the lifting handle.

The Tabor abrasion test equipment and accessories are fully described in the company's Bulletin 4012 which will be mailed upon request.



Projectile
Washing
and Drying
Machines

Short Cuts in Operating Costs

Metalwash Equipment for

Artillery Cartridge Case Spray
Pickling and Process Machines
for Brass and Steel Cases.
Small Arms Cartridge Rotary
Pickling and Process Machines.
Mouth and Taper Anneal and
Treatment Process Machines.
Projectile Washing Machines.
Projectile Quenching Machines.
Special Washing and Treatment
Machines for Ordnance and
Artillery Components.



ROTARY TABLE
Washer for shells
and containers



Powerful Motorized
SPRAY UNIT
for racked or other
parts
Very Economical in
Water Consumption

METALWASH MACHINERY CO.

27-29 Haynes Avenue

Newark, N. J.

Manufacturers' Literature

Acid Pumps

U. S. Stoneware Co., Sales Dept., 60 E. 42nd St., New York City, have issued their 4-page bulletin No. 702 describing various centrifugal type acid pumps made by the company. Graphs show characteristic performances, and various technical data are given.

Blackening of Metals

Alrose Chemical Co., Box 1294, Providence, R. I., have just issued a comprehensive booklet describing the company's process for blackening steel called the "Jetal Process".

The booklet contains technical information prepared by a consulting laboratory describing the operation of the Jetal bath and features of the coatings produced. The features of the Jetal coatings are compared with those obtained in other types of blackening baths. In addition, the booklet contains an article by Dr. A. Kenneth Graham entitled, "Salt Spray Evaluation of Oiled Black Oxide Coatings on Steel".

Information on the company's soluble oils for use with the Jetal coatings as well as other products of the company, is given.

Clarifying Cutting Oils

Gale Oil Separator Co., Inc., Chrysler Bldg., New York, have issued a 4-page folder describing the company's system and equipment for purifying cutting oils and coolants. The operation and advantages of the system are described, and various users of the equipment are given.

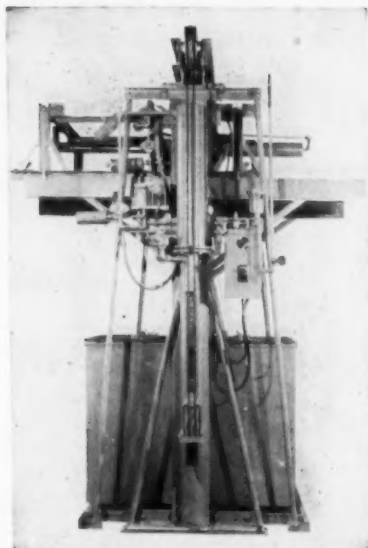
Cleaning Compounds for Electroplating

Magnuson Products Corp., 50 Court St., Brooklyn, N. Y., have just issued a folder entitled, "Permag Cleaning Compounds for the Electroplating Industry". This folder describes various cleaning compounds for such operations as still tank cleaning, cleaning of steel, cleaning copper alloys, cleaning aluminum, cleaning white metal and electrocleaning. Compounds for tumbling and burnishing are also described. Photographs illustrate typical operations in the use of the company's materials.

Cleaners for Aircraft Production

A comprehensive yet concise data manual of 40 pages covering all essential phases of cleaning required in aircraft production and maintenance has just been issued by Oakite Products, Inc., New York. Written specially for executives responsible for the various types of work where degreasing is an integral operation in the manufacturing cycle or in maintenance program as well as for those workmen charged with the actual performance of the cleaning, this manual gives factual information on several new, specialized materials for handling over 35 different cleaning operations by tank im-

Crown Pick-up Unit



...MACHINE...

A UNIT TYPE TRANSFER CAPABLE OF HANDLING SEVERAL TANKS AT ONE TIME.

...USE...

FOR A SERIES OF OPERATIONS WHERE THE WORK MUST PASS THROUGH SEVERAL TANKS, AS THE CLEANING AND RINSING OPERATIONS, FOR A SEMI-AUTOMATIC PLATING TANK.

CROWN RHEOSTAT & SUPPLY CO.
1910 MAYPOLE AVENUE :: :: CHICAGO, ILLINOIS

Some of America's biggest Defense Plants

Use

McKeon's

"Liquid Sulphur"
TRADE MARK REGD

For

Removing Copper

After

Selective Carburizing

Sample and Cooperation FREE

SULPHUR PRODUCTS CO.

Greensburg, Pa.

Shells & Cases
Land Mines
Fuses
Mess Kits

Bayonets
Searchlights
Helmets
Rifle Parts

Motor Parts
Planes Parts
Sub-Assemblies
Ship Fittings

AND ANY OTHER METAL UNITS IN ANY METAL OR SHAPE

Clean'em Better and Faster!

Even if you think your present metal cleaning methods "can't be beat"—you are interested in faster production through the metal cleaning bottle-neck. And you wouldn't mind improved quality of cleaning a bit.

You can get both, through a new method, using a new type of cleaner which isn't apt to become scarce due to raw material shortages.



2 or 3 Men in Your Plant Need This Book.

It covers the major metal cleaning problems found in war production and, recommends the methods and materials best adapted to them. It also includes complete data on the selection of the right type of mechanical metal washing machine for every purpose.

Let Us Have Their Names

MAGNUS EMULSO-DIP and EMULSO-SPRAY

are two variations of the same basic process, which tackles all the dirt commonly handled by alkaline cleaners and degreasing solvents and many that are not—such as "smut", certain buffing compounds, some lubricants and coolants, and the like. It does a far better job of removing solid particle dirt than any other method. It is faster, because it is simpler than other methods.

The work is dipped or sprayed in a cleaning solution, made up of one part Magnusol to ten parts kerosene or safety solvent. One minute or less of contact is enough. Then the work is flushed clear of dirt with water under pressure. That's all.

You get work of exceptional cleanliness. All dirt is removed. And the solution and rinse are used at room temperature.

"Metal Cleaning in Wartime" describes this new cleaning method in detail. Remember it also happens to be much lower in overall cost than other methods!

MAGNUS CHEMICAL CO., Inc.

Manufacturers of Cleaning Materials, Industrial Soaps, Metallic Soaps, Sulfonated Oils, Emulsifying Agents and Metal Working Lubricants.

11 South Avenue
GARWOOD, N. J.



MAGNUS CLEANERS

MACHINE DIVISION

Interested in mechanical washing machines for faster handling of your products? Let the Magnus Washing Machine Division help you to design the exact machine you need—and build it for you.

mersion, steam-detergent and air-pressure-spray methods.

Among the production operations discussed are cleaning aluminum alloy parts before resistance spot welding; preparing aluminum, magnesium and their alloys for anodizing or other protective surface treatment; degreasing ferrous and non-ferrous metals before such fabricating operations as heat treating, Magna-flux testing, pickling, inspection and assembly; rust-proofing parts in process; and preparing work for electroplating, painting, or other finishes. The data presented on airplane maintenance include cleaning planes after test flights; washing plane interiors; cleaning engines, wheels and under gear, cockpits, etc.

In addition, the manual also reviews a wide range of production equipment maintenance and plant housekeeping work common to aircraft and accessory manufacturing plants. Subjects discussed in this connection include cleaning paint spray booths, machine shop equipment, cutting and grinding oil lines; removing lime-scale deposits from refrigerating condensers, dynamometers and other water-circulating equipment; cleaning floors, walls, etc.; and laundering towels, uniforms, overalls, waste and wiping cloths.

Copies of this manual are available upon request. Write to Oakite Products, Inc., 18 Thames Street, New York City.

Conservation of Rubber

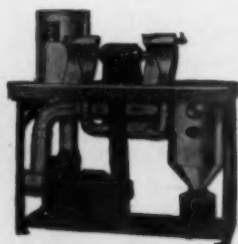
The U. S. Rubber Co., 1230 Sixth Ave., New York, have just published an important 45-page booklet entitled, "First Aid to Industry in Conserving Rubber". The many hints for conserving rubber articles are particularly important at the present time because of the rubber shortage. Drawings are used to augment the text to illustrate the correct and incorrect uses for such equipment as hose, belting, packings, taping, rubber goods, grinding wheels and various rubber rolls. Copies of this booklet can be obtained by writing to the U. S. Rubber Co.

Industrial Equipment

S. F. Bowser & Co., Inc., Fort Wayne, Ind., have recently published a 40-page catalog describing the various types of industrial equipment made by the company. This equipment includes that for filtration and distillation, lubrication, metering,



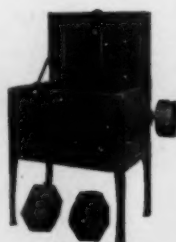
Blower



Polishing Bench



Dryer



Tubbing



Sawdust Box



Sandblast

THE BOLAND SYSTEMS

FOR FACTORY INSTALLATIONS
Tanks, Coloring Rooms, Dynamos, Sawdust Boxes

H. J. ASTLE CO., & INC. Established 1884

(Send for Catalogs) 118 Orange St., Providence, Rhode Island

pumping, refueling and for storage and dispensing. Drawings and half-tones are used to illustrate the various types of equipment.

Lead Coatings

"Republic Lead Coatings" is the title of U. S. Stoneware Company's new bulletin No. 1700. This bulletin, containing 12 pages, shows by means of excellent photographs, the methods employed in securing homogeneous lead coatings on various technical apparatus that have been lead coated. These apparatus include impeller fans, cooling and heating coils, autoclaves, tanks and anodes. Copy of this bulletin can be obtained by writing to the U. S. Stoneware Co., Sales Dept., 60 E. 42nd St., New York City.

Welding Spatter Prevention

Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Cal., have published a literature sheet describing their new product called "Weldmask", to be used in welding to prevent spattered molten particles from attaching themselves to the work. The advantages and properties of the material are described in the literature.

Fully Compensated Recording Thermometer

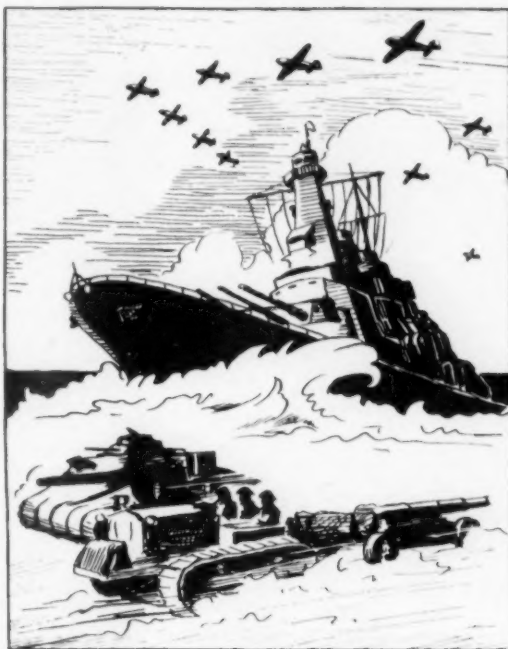
The Bristol Company, Waterbury, Conn., has just published a new bulletin Number T302, on its line of Fully-Compensated Liquid-Filled Recording Thermometers for temperatures between -125° F and $+400^{\circ}$ F.

The bulletin gives detailed information concerning construction of the instrument, the various forms in which it is furnished, and also information concerning its application.

Technical Publications

Selection and Conservation of Alloying Elements Used in Steels. Contributions to the Metallurgy of Steel, No. 6. American Iron & Steel Institute, 350-5th Ave., New York, May, 1942.

This very valuable booklet enables the ready determination of the effects of vari-



ON LAND IN THE AIR AND ON THE SEA

Harshaw Plating Materials are in the service . . . extensively used on machines and equipment that are subjected to corrosion, rust or wear.

Whatever your war production plating problem, contact Harshaw. Anodes and chemicals that meet or surpass specifications—our technical staff stands ready to assist you.

THE HARSHAW CHEMICAL CO.

Cleveland, Ohio, and Principal Cities

**ANODES AND
SALTS FOR
PLATING**

BRASS

BRONZE

CADMIUM

CHROMIUM

COPPER

GOLD

LEAD

NICKEL

SILVER

TIN

ZINC

AND CHROMIC
ACID FOR

ANODIZING

ROBERTS BUFFING COMPOUNDS ASSURE

*The Best Quality, Correct and Uniformly controlled manufacturing,
Fair Price Policy, and Special Formulas for Individual Demands.*

WE PRODUCE

ROUGES (Iron Oxides) (Quick wash) All types
TRIPOLI Numerous grades
EMERY PASTE All size grains
COMPOUNDS For every metal
GREASE STICKS For better efficiency
LIME COMPOUNDS Many formulas

— Let us send you some free samples —

The ROBERTS ROUGE COMPANY
STRATFORD CONNECTICUT

WASHING MACHINES

Tailor Made and Custom Built
to Solve

Your Specific Metal Cleaning
Problems

Let Us Quote on Your Current Needs

WASHING MACHINE DIVISION

MAGNUS CHEMICAL COMPANY

111 South Ave.

Garwood, N. J.



A MAGNUS PRODUCT

THE SPEED SOLUBILIZER



LIXOL

★ Removes oil, grease, smut, grime, and impacted abrasives. Use with water or kerosene. Protects against rust and tarnish. Excellent for production of physically clean surfaces without attack on production metals. Safe, versatile, efficient.

THE COWLES DETERGENT COMPANY
 7016 Euclid Avenue ★ Cleveland, Ohio

THE COWLES DETERGENT COMPANY, 7016 Euclid Ave., Cleveland, Ohio

Please send information on LIXOL for cleaning _____

Please send trial order of _____ Drums of LIXOL.

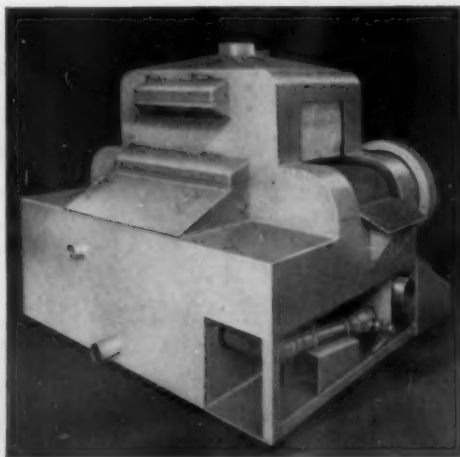
Name _____

Company _____

Address _____

City _____ State _____

Have you an inter-process Cleaning Problem?



This Ranshoff conveyor type, gas-fired washing machine meets a specific need —efficiently.

Fits into the production line for inter-process cleaning of metal parts and products.

Speed up production, reduce costs and get a better cleaning job with Ranshoff Equipment.

Phone or wire Dept. M.F. for a Ranshoff Representative. He will make recommendations to solve your particular metal cleaning problems.

N. RANSHOFF, Inc.

Metal Cleaning Specialists
 TOWNSHIP AND BIG FOUR R. R.
 CINCINNATI, OHIO

ous alloying elements, such as carbon, manganese, phosphorus, sulphur, silicon, chromium, nickel, molybdenum, vanadium and copper in steels. The effects of these materials on such properties as abrasion resistance, annealing, carburizing, corrosion, creep and distortion are given. The information is summarized generally in the form of graphs.

Steel Products Manual. Packaging, Loading and Shipping Methods for the Soviet Government Purchasing Commission in the U. S. A. American Iron & Steel Institute, 350-5th Ave., New York, June, 1942.

The booklet gives specific instructions for shipping various types of steel to the U.S.S.R. These types include wire, ingots, sheet, angles and coils.

Steel Products Manual. Packaging, Loading and Shipping Methods for China Defense Supplies, Inc. American Iron & Steel Institute, 350-5th Ave., New York, May, 1942.

The booklet gives specific instructions for shipping various types of steel to China. These types include wire, ingots, sheet, angles and coils.

Multiple-Coated Porcelain-Enameled Steel Utensils. Commercial Standard CS100-42. Price 5 cents. U. S. Government Printing Office, Washington, D. C.

New Books

Modern Electroplating

Modern Electroplating. Published by Electrochemical Society, Inc., 3000 Broadway, New York, N. Y. Size 6" x 9"; 400 pages. Cloth bound. Price \$5.50.

This book is the only modern book on general electroplating, and is a compilation of the papers and discussions presented at the Symposium on Electroplating, held in the Fall of 1941 in Chicago. Leading men in the industry were selected to prepare the articles.

The book opens with a chapter on general principles and methods of electroplating and most of the plating processes are then discussed in separate chapters. Plating of such metals and alloys as brass, bronze and other alloys, cadmium, chromium, cobalt, copper, gold, iron, lead, nickel, rare metals, silver, tin and zinc are discussed in detail. Each paper usually begins with an introduction that gives the historical background. Following this, the general principles of the plating bath are described. Then the constituents of the solutions are discussed in detail, as well as general operating conditions and characteristics of the bath. Methods of control and analysis are also given.

This book represents a milestone in the literature on electroplating and should be in the hands of all those engaged in plating or interested in the subject.

Volumetric Analysis. By I. M. Kolthoff and V. A. Stenger. 2nd Revised Edition.

Volume I: Theoretical Fundamentals. 6" x 9", 293 pages. Interscience Publishers, Inc., 215 Fourth Ave., New York, N. Y.

This book represents a thorough revision and enlargement of its predecessors. The section on oxidation-reduction indicators has been greatly extended. Some chapters were entirely rewritten and new material has been added such as a detailed discussion of errors caused by "mixed crystal formation." (It would have been more advisable to use the more generally used expression "solid solution" rather than the literal translation of the German expression.—Ed.)

The book, in brief, devotes itself to physical chemical problems pertaining to analysis. Ionization, hydrolysis and precipitation reactions are discussed. The important subject of indicators is ably treated as well as titration errors.

Factors influencing analysis, such as reaction velocity, adsorption, solid solution, and addition products are given proper consideration.

Some attention is given to less common methods of analysis such as polarimetric and conductometric titrations and spectrophotometric methods, and objection might be raised to the scant attention given to these newer but important methods. Usual tables are appended.

This book is a "must" for analytical chemists and those who wish to understand the fundamentals of analysis.

14,000 Gear Ratios. By Ray M. Page. 404 pages, 8½" x 11". Published by the Industrial Press, New York. Price, \$5.00.

This new book contains about 14,000 two-gear combinations and millions of possible four-gear combinations. The tables are presented in both common fractional and decimal forms, and are divided into four main sections, each of which is arranged to facilitate the solution of different classes of ratio and speed problems.

These four main sections are accompanied by typical examples showing how the different tables are utilized in obtaining practical gear combinations for precise timing or speed relationship between driving and driven shafts. The examples not only illustrate the use of the tables, but include methods of factoring and "rounding off" odd decimal ratios in cases where the exact ratio may not be obtainable, but a very close approximation is essential. These examples include the selection of change-gears for helical-gear hobbing, both on machines with and without a differential mechanism. This book of ratios may be applied in designing various types of transmissions, including spur, bevel, helical and worm gearing. With the aid of these tables, it is possible to solve readily ratio problems that otherwise would be very difficult, cumbersome or impossible.

Obituary

Dr. Albert J. Dornblatt

Dr. Albert J. Dornblatt, research chemical engineer in charge of the Metallurgy



Cutting Corners
... for Top Speed Production

Rounding corners or removing burrs by grinding or filing is too slow and costly to meet today's demands for speed and economy.

Barrel finishing has solved many such problems. Write to us about yours and send a few unfinished samples of your small, metal parts. We'll gladly tell you if they're adapted to finishing with Abbott barrels and materials.

The Abbott Ball Company
1046 New Britain Ave. Hartford, Conn.

Would you like a sample of the DENSEST, FINEST-GRAINED HARD CHROMIUM which can be produced?

Send for two samples, both plated for the same length of time, same current, same bath temperature, one plated in the ordinary chrome bath and the other in a bath prepared using ZIALITE ADDITION AGENTS.

Try stripping those samples in hydrochloric acid and see for yourself that the ZIALITE ADDITION AGENT sample requires several times as long to strip.

WHY? Because it is denser, harder, and finer grained. This means a more durable plate.

Additional advantages of the bath are the higher throwing power and a smoother, brighter, deposit.

ZIALITE CORPORATION

143 Exchange Street

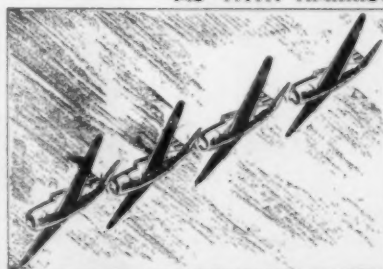
Worcester, Mass.

UNPARALLELED UNIFORMITY

AS WITH HARRISON'S 4A PRODUCTS

FOR GETTING MORE WORK
FROM YOUR GRAIN
USE

4A CEMENT and THINNER
A Substitute For Glue



NO WORRY ABOUT GLUE SHORTAGE WITH 4A CEMENT AND THINNER. Polishing wheels are free cutting, long lasting and economical when set up with 4A Cement.

COLORING ROUGES

UNIFORM, CAREFULLY GRADED RAW MATERIALS, EXPERTLY COMPOUNDED BY HARRISON'S TECHNICIANS, INSURE ROUGES THAT GIVE HIGH LUSTER AND FAULTLESS FINISHES.

POLISHING COMPOUNDS

4A symbolizes those four features which you require for high speed polishing, mirror finishing of all kinds of steel, including stainless steel, carbon steels and hard-to-buff alloys. Use it on any kind of a wheel, soft, medium or hard.

Tell us your problem and samples of compounds, rouges or cement will be sent.

We will be pleased to recommend proper methods.

"AMPLE STOCKS TO TAKE CARE OF OUR TRADE"

HARRISON and COMPANY
Haverhill, Mass.



FELT DOES IT BETTER

What a difference in your finished product when you use *Paramount Felt Polishing Wheels* for grease polishing—that all-important finish that swings the buyer's decision to your product.



Ask your supplies salesman
for PARAMOUNT BRAND

Bacon Felt Co.

WINCHESTER, MASS. ESTABLISHED SINCE 1824



GOVERNMENT ACCEPTANCE

of a finishing process is a necessary step to securing the contract.

BLACK-MAGIC

"the one bath process"

is accepted by Army, Navy, Marine, Air Corps, and Chemical Warfare Departments on many war production projects.

BLACK-MAGIC processes for Steel, Iron, Copper, Zinc. Witch-Dip, a wax base rustproofing final finish. Write for Portfolio of complete information including equipment.

THE MITCHELL-BRADFORD CHEMICAL CO.

BRIDGEPORT, CONN.

PHONE 7-1390

PERMAG Cleaning Compounds



PERMAG Compounds are developed for specific requirements, based on scientific formulas. We now have over 300 that fit special industrial purposes.

*—quick and efficient for producing
100 per cent clean Surfaces on Metal*

PERMAG Compounds have stood all tests. Today they are helping metal fabricators to keep up production and keep rejects at a minimum. PERMAG removes oil, grease, smut, polishing compounds, every foreign particle, and bringing a chemically clean surface for finishing operations.

Let Magnuson Cooperative Service help you in any special cleaning problem you may have. Write or telephone. No obligations.

MAGNUSON PRODUCTS CORPORATION

Main Office 50 Court Street, BROOKLYN, N. Y.

Representatives from coast to coast. Warehouses in Principal Cities.
In Canada: Canadian Permagon Products, Ltd., Montreal and Toronto.

Division of Crown Cork & Seal Co., Baltimore, Md., died on February 2, 1942, at the age of 36 years.

After attending the University of Georgia, Dr. Dornblatt received his Ph.D. degree from Columbia University where he worked under Dr. Colin G. Fink. His thesis was entitled, "The Effect of Silver (0.05 to 0.15%) on Some Properties and the Performance of Antimony-Lead Storage Battery Grids". He had been associated with the National Bureau of Standards on silver research and since June, 1940, had been connected with the Crown Cork & Seal Co.

Dr. Dornblatt had written several books, and his biography appears in American Men of Science. He had been Head of the Department of Chemistry and Metallurgy in the Post Graduate School of the Naval Academy at Annapolis where he taught metallurgy. He was a Lieutenant, Senior Grade, in the U. S. Naval Reserve.

Communications from Our Readers

Anodizing Aluminum Tanks

Johannesburg, South Africa

April 5, 1942

"Dear Dr. Meyer:

I would like to give a tip, which I have not seen in print and which was, as far as we know, discovered at our shop in Germiston.

When anodizing Dural or aluminum tanks, this is easily done on the inside as well as the outside at the same time, providing that no pressure is allowed to build up inside the tank.

To avoid pressure of gas in the inside, the tank should be immersed to half way up the filling orifice (bung-hole) and anodized as usual, then reversed, and the other half anodized under the same conditions. The possibility of fluxes being left inside can be overcome by boiling the tank in water for half an hour before treatment.

Hoping this will be of use to you, I am

Yours faithfully,

Harold Knocker."

Facilities Available for Plating Fine Wire

June 23, 1942.

Dear Dr. Meyer:

We are a company possessing equipment for plating of small gauge wire up to 0.005", and wish to state that we have capacity available to do job plating with our equipment.

We are prepared to gold, silver or copper plate wire to specification. We would also like to point out that we can plate wire as fine as 0.002".

We will be pleased if anyone interested in plating of fine wire will communicate with us directly.

Very truly yours,

H. P. EDINGA,

Wire Division,

North American Philips Co.

Dobbs Ferry, N. Y.

Business Items

Joseph B. Kushner, Ch.E., metal finishing consultant, 233 W. 26th St., New York, is in no way connected with or related to Mr. Kushner of Kushner & Pines, Inc., gold refiners of 21 W. 46th St., New York.

John G. Beach has been named a research engineer on the technical staff of Battelle Memorial Institute, Columbus, Ohio, where he has been assigned to the division of electrochemistry.

Mr. Beach is a graduate in chemical engineering of the Missouri School of Mines. Prior to joining the Battelle staff he was associated with the Sherwin-Williams Corporation, Detroit, Michigan. He is a member of the American Chemical Society.

Quaker Chemical Products Corporation, Conshohocken, Pa., has announced it has established new and larger warehouse and blending plant facilities in Chicago to give better service to its customers in that area.

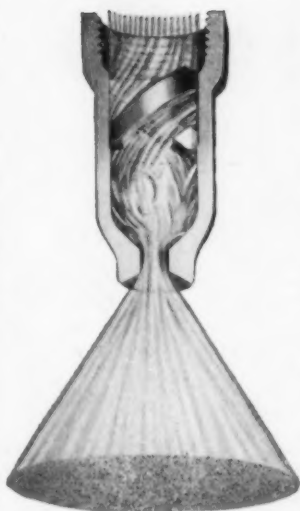
R. L. Phillips is plant manager and the new location is: Quaker Chemical Products Corp., 9243 Baltimore Avenue, Chicago, Illinois. Telephone—South Chicago 7341.

Members of the local technical service staff are K. B. Copeland and C. O. Judd.

The new plant is serving Illinois, Northern Indiana and Wisconsin.

Keystone Carbon Co., St. Marys, Pa., manufacturers of precision molded products, are completing a large program of expansion including plant and production facilities. This project was necessary due to the increased demand for materials produced by powder metallurgy by which Keystone makes metal-graphite, carbon and graphite brushes, "Selflube" porous bearings and negative temperature coefficient resistance material.

John L. Merigold, who for many years has operated a plating shop in Los Angeles devoted to gold plating for manufacturing jewelers, such as Joseph's of Hollywood



FULLJET . . . solid cone spray pattern. Correct design assures uniform distribution and non-clogging characteristics.

SPRAY NOZZLES for faster cleaning

For thoroughness and speed, you can't beat spray cleaning for metal parts of every size and shape. We make spray nozzles of all types and sizes for every cleaning operation, electroplating, degreasing, bonderizing, etc.

Write today for catalog listing sizes, types, application and performance tables. Let us help you with your spray cleaning problems; that's our business.

Spray Cleaning is Speedier!

SPRAYING SYSTEMS CO.

4039 W. Lake St., Chicago, Ill.

BRING YOUR PROBLEMS TO FINISHING HEADQUARTERS

McAleer is the source for **all** types of finishing materials. McAleer has laboratory facilities and technicians to solve special problems—develop new compounds.

Headquarters for sanding, rubbing and buffing compounds, tripoli, grease stick, rouge, white finish, emery cake and paste.

Distributors Valencia Pumice
Powdered and Lump

McALEER MANUFACTURING COMPANY
ROCHESTER, MICHIGAN

WASHING MACHINES

Let Us Quote on Your Current Needs

F Faster Production
O Better Cleaning
R Lower Overall Costs

WASHING MACHINE DIVISION
MAGNUS CHEMICAL COMPANY

111 South Ave.

Garwood, N. J.



A MAGNUS PRODUCT

DO YOU HAVE A PROBLEM OF DEBURRING OR GRINDING AND POLISHING PRECISION PARTS?

Regardless of size or shape, Lupomatic has a way of handling your particular job. We are equipped with a Laboratory to work out your problem free of charge. We place our Engineering Dept. at your service.

Write us today for full details.

LUPOMATIC TUMBLING MACHINE CO., INC.

4510 Bullard Ave., New York, N. Y.



**BRASS
SHEET**
Bronze and Gilding
Processed For
Difficult Drawing
Bright Finishes

**ROD - WIRE
BRISTOL, CONNECTICUT**

Offices:
15 Park Row
NEW YORK

Hospital Trust Building
PROVIDENCE, R. I.

WASHING MACHINES

Designed to Meet
Your Specific Needs
in Cleaning Any Metal—Any Unit

Let Us Quote on Your Current Needs

WASHING MACHINE DIVISION
MAGNUS CHEMICAL COMPANY

111 South Ave.

Garwood, N. J.



A MAGNUS PRODUCT

For a real good polishing job use

KEYSTONE EMERY

Write for Sample

KEYSTONE EMERY MILLS, 4318 Paul St., Phila., Pa.

and others, on June 1 opened a new shop at 424 South Broadway in which he is specializing in gold plating, and will also handle some zinc work.

Mr. Merigold has installed a well-equipped shop in Room 512 of a downtown building to conduct the special work on which he will concentrate. He reported he was engaged on a large contract for the U. S. Signal Corps. Opening of the new shop climaxes nearly half a century in the business for Mr. Merigold, for 1942 marks the 49th year in which he has been active in some phase or other of the plating and finishing trade.

The Pacific Steel Treating Co. has been founded by William McCullough and Bert Wells of Los Angeles. Manufacturing space has been taken at 1155 East Pico Blvd., Los Angeles.

U. S. Stoneware Acquires Prominent Mechanical Rubber Goods Plant

The Chamberlain Engineering, Ltd., a unit of the United States Stoneware Co. has just purchased the business and mechanical rubber goods factory of the Lower Rubber Mfg. Co. at Ravenna, Ohio. The plant was built in 1938 and its equipment, therefore, is thoroughly modern.

This new Lower Plant will be used principally for milling, calendering, extruding and molding operations on the "Tygon" series of synthetic rubber like materials. Provision will also be made for the production of U. S. Stoneware's "Duralon",—the synthetic resin with a polymerized furfural orthosilicate base,—as a substitute for hard rubber in all extruded and molded shapes.

The old and varied mechanical rubber goods line of the former Lower Company will be retained. Many new rubber items

VULCAN SODIUM STANNATE

Manufactured by

THE VULCAN DETINNING CO.
SEWAREN, N. J.

Under Patents Nos. 1,575,217 and 1,708,392

FOR TIN ELECTROPLATING

SALES AGENT

The R. & H. Chemicals Dep't, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.



Made from the highest quality selected ores obtainable in this country and in the same careful and thorough manner as imported emeries.

These rough-surfaced solid shaped grains hold unusually well in the glue.

Write for full details.

HAMILTON
EMERY & CORUNDUM CO.

Chester

Mass.

STEEL BALLS

Burnishing and polishing balls and mixtures. Absolutely guaranteed not to wear out through burnishing use.

THE HARTFORD STEEL BALL CO.
HARTFORD, CONNECTICUT

WORLD'S FINEST PRE-FINISHED METALS • SHEETS & COILS

NICKEL, CHROMIUM, BRASS AND COPPER FINISHES

AMERICAN NICKELOID COMPANY

8 SECOND ST. PERU, ILLINOIS

**FOR STRIPPING COPPER
USE "LIQUID"**

OXY-DYZ-ENE

Sold by
Leading Plater Supply Houses
Manufactured Since 1875 by

KREMBS & COMPANY
669 W. OHIO ST. CHICAGO, U.S.A.

**PLATERS and POLISHERS
DATA BOOK**



Chemical Engineering Data,
Useful Tables, Instructions.
How to clean Easier, Quicker,
Less operations, No peeled
plate, no rejects.
Send for FREE copy today

Puritan Mfg. Co., Waterbury, Conn.
Originators and Manufacturers of
**WONDERBAR, Pre-Saponified
BUFFING, POLISHING COMPOUND**

**CHROMIUM PLATING
SCREWS—RIVETS—
WASHERS
SMALL PARTS, ETC.**

**THE CHROMIUM PROCESS
CO.
Shelton, Conn.**

INSULATED PLATING RACKS

Special and Standard Sizes
For all parts regardless of shape. We specialize in
your rack problem.

STANDARD PLATING RACK CO.
1925 N. Paulina St., Chicago, Ill.
ARMITAGE 6766

WASHING MACHINES

F Alkaline Cleaning
O Degreasing Solvents
R Emulso-Dip or Emulso-Spray
Any Metal—Any Method—Any Size

Let Us Quote on Your Current Needs

**WASHING MACHINE DIVISION
MAGNUS CHEMICAL COMPANY**

111 South Ave. Garwood, N. J.



A MAGNUS PRODUCT

will also be produced for the Chemical Warfare Service and other war agencies.

The technical facilities and sales organizations of the two companies will be merged. *M. S. Lower*, former President of the Lower Rubber Mfg. Co., will serve as General Manager of the plant, which will be operated as the Lower Rubber Mfg. Division.

**Westvaco Consolidates Subsidiary
Companies**

On July 1, the Sales and Technical services of Warner Chemical Company division, California Chemical Company division, the Magnesol Company division and the National Kellastone Company division will be integrated into Westvaco Chlorine Products Corporation. No changes in personnel or functions are involved in this move, company officials explained, the purpose of the integration being to render a better service to government and industrial consumers.

With this consolidation of activities, Westvaco chemical plants at Carteret, New Jersey, South Charleston, W. Va., and Newark, California, will be more closely tied together. Westvaco's extensive magnesite mining operations at Luning, Nev., Gustine, Calif., Livermore, Calif., Patterson, Calif., Chula Vista, Calif., will also be integrated into closer contact with the Sales and Technical Division of the parent company.

Principal offices of Westvaco Chlorine Products Corporation will continue to be in the Chrysler Building, New York, where the company occupies two floors. Branch offices are located in Chicago, Greenville, S. C., and Newark, Calif. Officers are *William B. Thom*, President, *Max Y. Seaton*, Executive Vice-President and Technical Director, *Louis Neuberger*, Vice-President Sales, and *Maurice Gilbert*, Secretary and Treasurer. *W. N. Williams* is in charge of Westvaco production while *J. Rivers Adams* is Sales Manager.

BUFFS, CLEANERS

**Buffing Compositions
Nickel Anodes
Chemicals and General Supplies**

JACOB HAY COMPANY
4014 W. Parker Avenue
Chicago, Ill.
Albany 2742

Truly—Three Great Finishes!!

**CHROMIUM—UDYLITE—
SHERARDIZING**

For over a quarter of a century building and installing portable sherardizing furnaces and equipment; metal finishing and plating. We invite your inquiry.

**THE NATIONAL SHERARDIZING &
MACHINE CO.**

Office & Factory Hartford, Conn.
Foreign Representatives—*Oliver Bros., Inc.*,
417 Canal St., N. Y. City

RIBBON ZINC

For stamping and drawing

FUSE METAL

For fuse elements

ZINC WIRE

**The Platt Bros. & Co.,
Waterbury, Conn.**

A Complete Line of Requirements
for the Electroplating Industry



MUNNING & MUNNING, Inc.
Manufacturers of Electroplating, Buffing, Polishing
Apparatus and Supplies.
202-208 Emmet St. Newark, N. J.
Branch Offices: New York, Philadelphia,
Woonsocket, R. I.

NICKEL SILVER

Sheets—Rolls

**Phosphor Bronze, Bronze Gilding Metal
Low Brass and Special Alloys**

WATERBURY ROLLING MILLS, Inc.

Waterbury, Conn.

Today's Most Efficient Method

•AUTOMATICALLY

FOR VOLUME

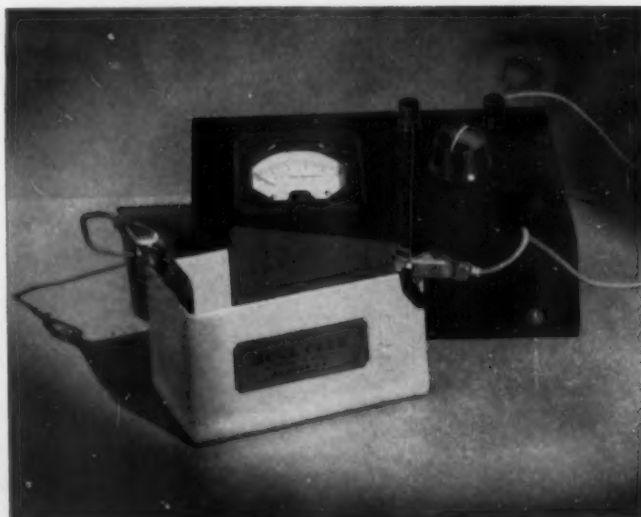
POLISHING & BUFFING

War Production Demands necessitate a speeding-up of Industrial Production—PACKER-MATIC is doing its part in many lines of industry.

•AUTOMATIC POLISHING & BUFFING MACHINES

Packer-Matic

THE PACKER MACHINE CO., MERIDEN, CONN., U. S. A.



THE HULL CELL

New small size now available for controlling and developing plating solutions.

Write for Literature

KOCOUR CO.

4724 S. CHRISTIANA AVE.

CHICAGO

★ TESTING SETS FOR ALL SOLUTIONS ★



What- No Dingleberries?

No! No more DINGLEBERRY trouble—no more chipping—no more chiseling. Here is a new help for the torch- and arc-welder. The sensational new ...

TURCO WELDMASK

prevents spattered particles of metal from sticking to the surface around the weld. Remove them in a jiffy with a hand wirebrush and water. Turco Weldmask cuts after-welding cleanup time 50%. Can be applied any time in advance of the welding operation. Does not evaporate. Non-toxic. Non-inflammable. Can be used on steel, stainless steel, aluminum or magnesium. Write for Turco Bulletin No. A-22, or phone your local Turco Service Specialist.

TURCO PRODUCTS, INC.

LOS ANGELES • SAN FRANCISCO • CHICAGO
HEAD OFFICE: 6135 So. Central Ave., Los Angeles
Sales and Service Representatives and Warehouse
Stocks in All Principal Cities

Factories in Los Angeles and Chicago

WASHING MACHINES

Designed and Built Around:
The Most Suitable Cleaning
Material and Method for
Your Particular Operations

Let Us Quote on Your Current Needs

WASHING MACHINE DIVISION
MAGNUS CHEMICAL COMPANY

111 South Ave.

Garwood, N. J.



A MAGNUS PRODUCT

Plating and Finishing Guidebook **1942 EDITION**

Edited by
DR. WALTER R. MEYER

The composite efforts of 25 experts in
the plating and finishing industry.
New Sections. Complete Revision.

YOUR SUBSCRIPTION TO METAL FINISHING WILL
BRING YOU, FREE, THIS AUTHORITY
AND MODERN BOOK.